PB89-204853

Superfund Record of Decision (EPA Region 9): Selma Pressure Treating Company, California (First Remedial Action), September 88

(U.S.) Environmental Protection Agency, Washington, DC

24 Sep 88

U.S. Department of Commerce
National Technical Information Service
NTIS

United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R09-88/025
September 1988

PB89-204853

EPA

Superfund Record of Decision:

Selma Treating, CA

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

50272-101

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First Remedial Action - Final

5. Report Date 09/24/88

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Washington, D.C. 20460

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16. Abstract (Limit: 200 words)

The Selma Pressure Treating Company is located in Selma, California, 15 miles south of the City of Fresno. The site encompasses approximately 18 acres, including a 3 to 4-acre wood treatment facility and 14 acres of adjacent vineyards that were used for site drainage. Land use in the vicinity of the site includes agricultural, residential, and industrial areas, with 12 residences and businesses located within 0.25 mile. The ground water resources in the area have been classified as a Sole-Source Aquifer and a current drinking water source with other beneficial uses. Wood preserving activities using pentachlorophenol (PCP) were conducted at the site from 1942 until 1965 under a series of owners. In 1965, a new facility was constructed converting operations to a pressure treating process using chemical preservatives. Prior to 1982, wastes generated from spent retort fluids and sludges were discharged to drainage and percolation ditches, dry wells, and an unlined pond and sludge pit, as well as onto open ground and the adjacent vineyards. An inspection conducted by EPA in 1981 raised concerns about the potential for ground water contamination, and as a result the company was required to modify its operations to minimize the potential for contamination. The total volume of soil requiring remediation is approximately 16,100 yd^3. The primary contaminants of concern affecting the ground water and soil are organics including dioxin and
(See Attached Sheet)

Continued, pg 2

17. Document Analysis a. Descriptors
Record of Decision
Selma Pressure Treating Company, CA
First Remedial Action - Final
Contaminated Media: gw, soil
Key Contaminants: organics (dioxins/furans, phenols), metals (arsenic, chromium)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement

19. Security Class (This Report) None

20. Security Class (This Page) None

21. No. of Pages 123

22. Price PC 21.95 / MF 6.95

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

EPA/ROD/R09-88/025
Selma Pressure Treating Company, CA
First Remedial Action - Final

con't from PD

16. ABSTRACT (continued)

phenols, and metals including arsenic and chromium.

The selected remedial action for this site includes: ground water pump and treatment using precipitation, coagulation, and flocculation with reinjection into the aquifer or offsite discharge; soil excavation and solidification/stabilization with replacement in excavated areas and capping fixed soil with a RCRA cap; ground water and soil monitoring for approximately 30 years; and long-term access and land use restrictions for fixed areas and short-term institutional controls for ground water use. The estimated present worth cost for this remedial action is $11,280,000 with annual O&M of $1,300,000.

RECORD OF DECISION
FOR THE
SELMA PRESSURE TREATING COMPANY
SUPERFUND SITE

PREPARED BY
THE U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IX
SAN FRANCISCO, CALIFORNIA

SEPTEMBER, 1988

TABLE OF CONTENTS
SELMA RECORD OF DECISION

Page

Declaration for the Record of Decision 1
Decision Summary........3

I. Site Name, Description, and Location........3

II. Site History and Enforcement Activities........5

III. Community Relations........8

IV. Site Characteristics........9
  A. Surface and Subsurface Soil Results........9
  B. Soil Clean-up Goals and Areas Requiring Remediation........15
  C. Groundwater Results........16
  D. Groundwater Clean-up Goals........19

V. Summary of Site Risks........20
  A. Chemicals of Concern........20
  B. Exposure Pathways........21
  C. Toxicity of Chemicals of Concern........21
  D. Risk Characterization........22
  E. Analytical Methods Used........24

VI. Documentation of Significant Changes, Section 117(b)&(c)........24

VII. Description of Alternatives........24
  A. Alternative 1........24
  B. Alternative 2........24
  C. Alternative 3........26
  D. Alternative 4........30

VIII. Summary of Comparative Analysis of Alternatives........32
  A. Overall Protection of Human Health and the Environment........32
  B. Compliance with ARARS........33
  C. Long-term Effectiveness and Permanence........33
  D. Reduction in Toxicity, Mobility, and Volume........33
  E. Short-term Effectiveness........34
  F. Implementability........34
  G. Estimated Capital, O&M, and Present Worth Cost........35
  H. State and Community Acceptance........35

XI. The Selected Remedy........35

X. The Statutory Determinations........36
  A. Protection of Human Health and the Environment........36
  B. Attainment of ARARS........36
  C. Cost-effectiveness........37
  D. Utilization of Permanent Solutions Employing Alternative Technologies to the Maximum Extent Practicable........38

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

The Selma Pressure Treating Company (SPT) site is located in Selma, California, 15 miles south of the City of Fresno, in California's Central Valley.

STATEMENT OF BASIS AND PURPOSE

This decision document represents the selected remedial action for the Selma Pressure Treating site, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, and the National Contingency Plan. This decision is based on the administrative record for this site. (The attached index identifies the items which comprise the administrative record upon which the selection of the remedial action is based). The State of California has concurred on the selected remedy.

DESCRIPTION OF THE SELECTED REMEDY

This Record of Decision (ROD) for the Selma Pressure Treating site includes the following actions to address contaminated soil and groundwater for the entire site (there are no operable units):

- Conventional water treatment to remove chromium from the groundwater, including:
  - Extraction of contaminated groundwater
  - Treatment of contaminated groundwater using precipitation, coagulation, and flocculation processes to remove chromium to meet the applicable drinking water standard
  - Disposal of treated and tested groundwater by reinjection into the aquifer or off-site disposal, as appropriate
  - Groundwater monitoring to verify contaminant clean-up
- Soil fixation with a Resource Conservation and Recovery Act (RCRA) Cap to treat contaminated soil, including:
  - Excavation of contaminated soils exceeding cleanup goals
  - Mixing soils with a fixative agent to solidify and stabilize contaminated soil
  - Replacement of fixed soil into excavated areas and covering the fixed areas with a RCRA Cap

- Long term monitoring of fixed soils for a period of approximately 30 years
- Long-term access and land use restrictions for fixed areas and short-term institutional controls to prevent use of contaminated groundwater until remediation is complete

DECLARATION

The selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate to this remedial action and is cost-effective. The groundwater remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions to the maximum extent practicable. The soil fixation/RCRA Cap element of this remedy is not considered fully permanent, due to the need for long-term monitoring. It does employ treatment that significantly reduces mobility as a principal element. However, toxicity is not reduced and volume is increased due to addition of the fixative agent.

Because this remedy will result in hazardous substances remaining on the site, a review will be conducted within five years after commencement of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. The State's letter of concurrence is attached.

Daniel W. McGovern 9·24·88

Daniel W. McGovern
Regional Administrator

Date

DECISION SUMMARY

I. SITE NAME, DESCRIPTION, AND LOCATION

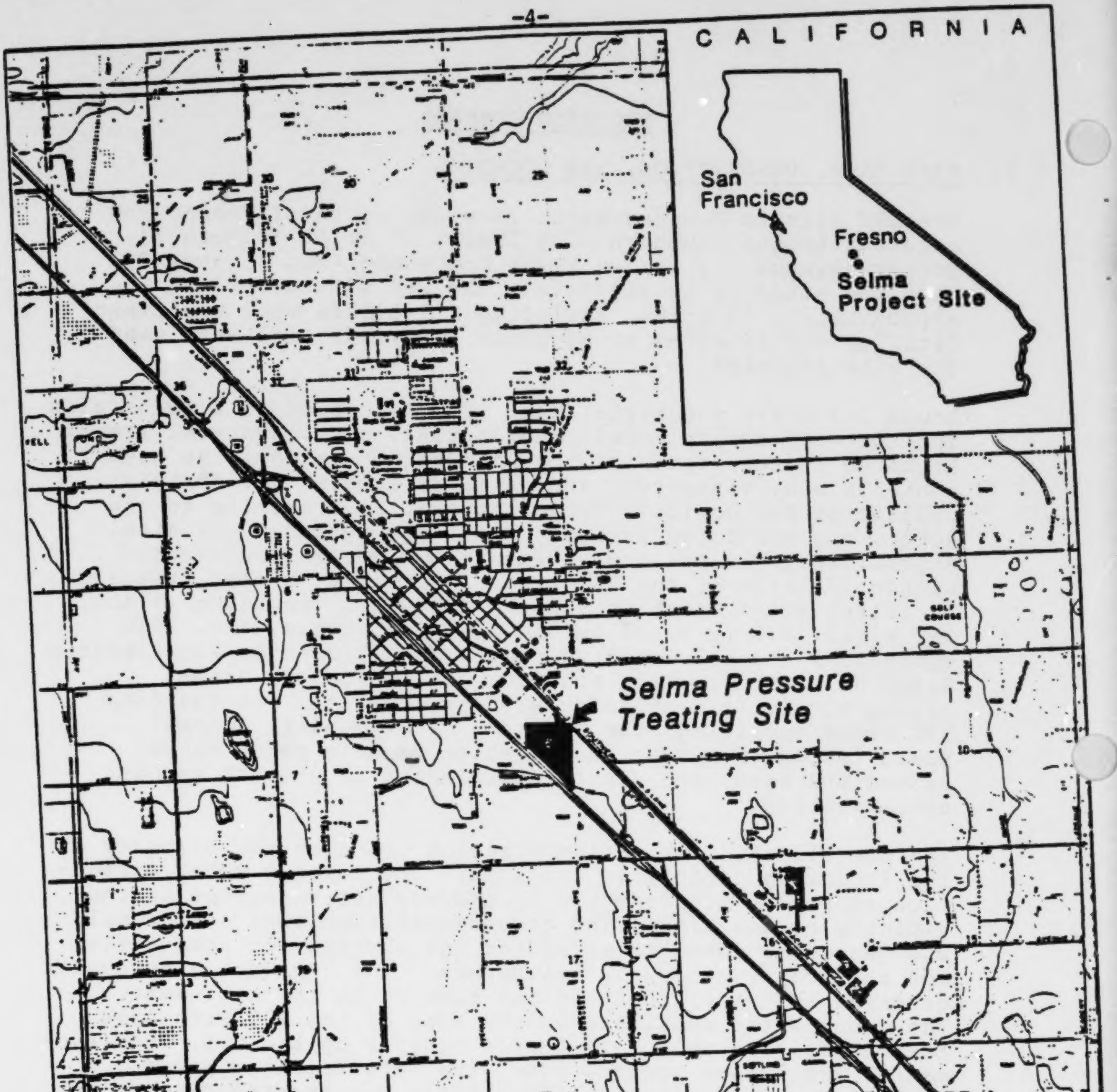
The SPT site is located about 15 miles south of Fresno and adjacent to the southern city limits of Selma (Figure 1). Dockery Avenue and Golden State Boulevard (old Highway 99) mark the entrance to the site. The SPT site comprises approximately 18 acres, including a 3-4 acre wood treatment facility and 14 acres of adjacent vineyards that were used for site drainage.

Zoned for heavy industrial use, SPT is located in a transition zone between agricultural, residential, and industrial areas. Situated in the center of the San Joaquin Valley, the area contains many vineyards, and Selma is labeled the "Raisin Capital of the World." Urban residential areas lie to the north, and scattered suburban dwellings surround the site. Approximately 12 residences and/or businesses are located within 1/4 mile of the SPT site. Currently, a wood treating facility, Selma Treating Company (STC), is operating at the SPT site. STC is owned by Saw Mill Properties, Inc. STC operations are regulated by state Waste Discharge Requirements Order No. 78-171, which precludes discharges to areas having hydraulic continuity with groundwater. At the time STC began operating, the Regional Water Quality Control Board (RWQCB) required installation of drip pads, berms around the site, and runoff containment to prevent ongoing contamination.

The Consolidated Irrigation District provides the majority of the irrigation supply in the area. The surface water irrigation supply is supplemented by groundwater resources in the vicinity of the site. The groundwater resources also supply the necessary domestic water for the surrounding communities and the scattered county residences. The regional groundwater gradient in the vicinity of the site is to the southwest. The groundwater resources in the area of the SPT site have been classified as a Sole-Source Aquifer by the U.S. Environmental Protection Agency, under the Safe Drinking Water Act, 42 U.S.C. §1424(e). Under EPA's Groundwater Protection Strategy (1984), the aquifer in the SPT area has been classified as a Class II A current drinking water source with other beneficial uses.

No other significant natural resources were found at SPT, such as federal or state rare, threatened, or endangered species, or wetlands. The site is not included on the National Register of Historic Places under the Historic Preservation Act of 1966, 16 U.S.C. §470 _et seq_.

The climate for the site consists of hot summers and mild winters. The maximum temperatures are generally around 100°F in July, with a minimum temperature of 35° in January.


CALIFORNIA
San Francisco
Fresno
Selma Project Site
Selma Pressure Treating Site
SELMA
north
0 1 2 3 4 5
THOUSANDS OF FEET

Project No.	Selma Pressure Treating Site	REGIONAL LOCATION MAP	Figure 1
123-RI1	Camp Dresser & McKee Inc.		

Average annual precipitation in the area is less than 10 inches. The monthly evaporation losses range from two inches per month during the winter to 18 inches per month during the summer.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

Treatment of lumber products has been ongoing at the SPT site since 1942. The original wood treatment facility covered approximately 3-1/2 acres. In 1961, the treatment operation was taken over by Gerald Petery, the son of the original owner, and his wife, Mary Ann Petery (now Schuessler). A summary of the operating history of the Potential Responsible Parties (PRP's) is as follows:

Dates	Owners
1961-1/1970	Gerald Petery and Mary Ann Petery operated the facility as individuals.
1/1970-12/1977	Gerald Petery and Mary Ann Petery incorporated as Selma Pressure Treating Company, which was responsible for operating the facility.
1971-Present	Selma Leasing Company (SLC) was organized and owned by Gerald Petery. SLC became the owner of the land upon which SPT, and later Saw Mill Properties, Inc., operated.
12/1977-late/1981	Gerald Petery sold his interest in SPT to Mary Ann Schuessler (formerly Petery). Mary Ann Schuessler became the sole owner, president, and operator of SPT.
4/1981	SPT filed for bankruptcy and First Interstate Bank or a trustee took over the operation.
2/1982	SPT's trustee sold wood treating assets to Saw Mill Properties, Inc.
2/1982-Present	Saw Mill Properties, Inc. has operated the facility, as Selma Treating Company.

The wood-preserving process originally employed at the site involved dipping wood into a mixture of pentachlorophenol and oil, and then drying the wood in open racks to let the excess liquid drip off. A new facility was constructed in 1965, and SPT converted to a pressure treating process which consisted of conditioning the wood and then impregnating it with chemical preservatives.

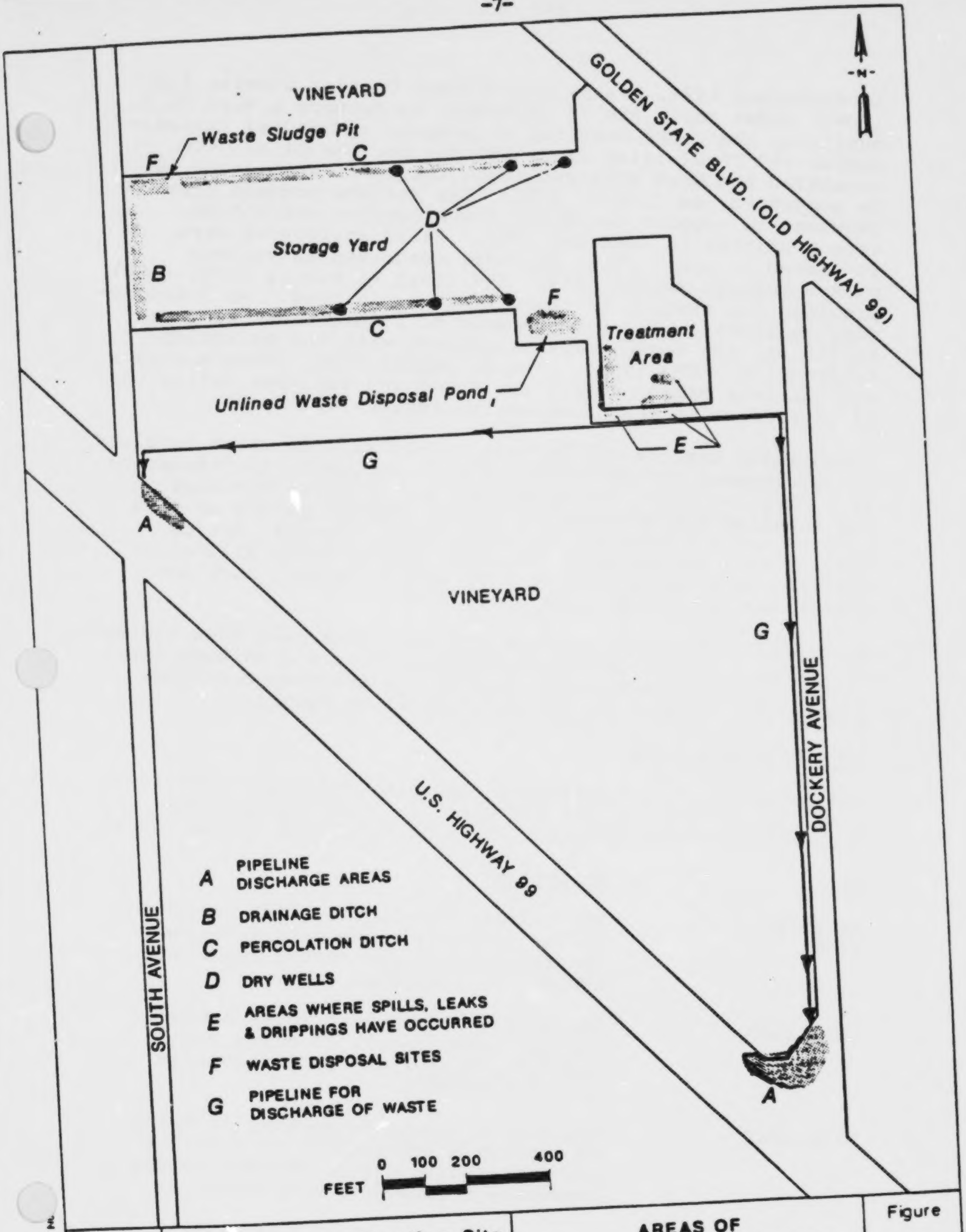
Prior to 1982, discharge practices included: (1) runoff into drainage and percolation ditches, (2) drainage into dry wells, (3) spillage onto open ground, (4) placement into an unlined pond and sludge pit, and (5) discharges to the adjacent vineyards. These wastes were generated from spent retort fluids and sludges. Figure 2 depicts these disposal sites.

Between 1971 and 1981, the Regional Water Quality Control Board (RWQCB) regulated the discharges from SPT, under a Waste Discharge Requirements Order. An Uncontrolled Hazardous Site Investigation was conducted on January 31, 1981 in accordance with §3007 of the Resource Conservation and Recovery Act (RCRA), by the EPA's Field Investigation Team (FIT), the California Department of Health Services (DHS), and the RWQCB. This inspection raised concerns about the potential for groundwater contamination from the site. As a result, SPT was required to modify its operation to minimize the potential for contamination. Initial site investigation activities were then conducted by the state and EPA to assess contamination problems.

Between 1981 and 1984, RWQCB, EPA, and DHS pursued efforts to have SPT and, later, SLC investigate the site to determine the extent of contamination. In September of 1981, the RWQCB issued a Cleanup and Abatement Order to SPT, requiring a geotechnical investigation and establishing a timetable for cleanup. The timetable for cleanup was not submitted to the RWQCB and in September of 1984, the RWQCB referred the Order to the California Attorney General's office, for enforcement. The Attorney General's office is pursuing a case against SLC, SPT, Gerald Petery, and Mary Ann Schuessler, on behalf of itself and the RWQCB. Gerald Petery has filed a cross-claim against a number of parties, including Mary Ann Schuessler, various chemical manufacturers of PCP, EPA's consultant, CDM, First Interstate Bank, Koppers, and Osmose.

In September of 1983, DHS informed SPT of violations and transmitted an Order, Settlement Agreement, and Schedule of Compliance, including civil penalties of $75,000. In December of 1983, DHS found SLC's counter proposal to this Order to be unsatisfactory. DHS referred the site to EPA for further action in April of 1984.

In August of 1983, EPA ranked the site using the Hazardous Ranking System (HRS) 40 C.F.R. Part 300, Appendix A, as authorized under 42 U.S.C. §105(a)(8), to determine whether to include the site on the Superfund National Priorities List of hazardous waste sites. The HRS ranking for the site indicated that releases of hazardous substances from the site may present a danger to human health and the environment. Based on this information the site was placed on the Superfund National Priorities List of hazardous waste sites in September 1983. The HRS ranking was 43.83, and the site was listed as number 195.


N
VINEYARD
Waste Sludge Pit
F
C
D
Storage Yard
B
C
F
GOLDEN STATE BLVD. (OLD HIGHWAY 99)
Treatment Area
Unlined Waste Disposal Pond
E
G
A
VINEYARD
G
DOCKERY AVENUE
U.S. HIGHWAY 99
SOUTH AVENUE
A
A PIPELINE DISCHARGE AREAS
B DRAINAGE DITCH
C PERCOLATION DITCH
D DRY WELLS
E AREAS WHERE SPILLS, LEAKS & DRIPPINGS HAVE OCCURRED
F WASTE DISPOSAL SITES
G PIPELINE FOR DISCHARGE OF WASTE
FEET
0
100
200
400

Project No. 123-FS1	Selma Pressure Treating Site Camp Dresser & McKee Inc.	AREAS OF SUSPECTED CONTAMINATION	Figure -2-

In September 1984, EPA requested Camp Dresser & McKee Inc. (CDM), under their REM II contract, to prepare a Work Plan outlining the tasks required to prepare a Remedial Investigation and Feasibility Study (RI/FS) for the site. CDM submitted the Work Plan outlining the RI/FS activities to be conducted, on June 7, 1985. The various project plans required to support the field investigation activities were submitted in 1985 and 1986. Field activities were initiated in April 1986, and were conducted in various phases through August 1987. The final RI report (CDM, 1988) provides the results of those field activities. An Endangerment Assessment (EA) was prepared to assess risks to human health and the environment associated with the No Action Alternative (ICF, 1988). The FS report (CDM, 1988) analyzes alternatives based on data collected and analyzed during the RI investigation and based on the results of the EA.

Potentially Responsible Parties (PRPs) have not been involved in development of the RI/FS. EPA is currently in discussion with PRPs regarding the potential for their involvement in the Remedial Design/Remedial Action (RD/RA) phases of this project and for recovery of past costs. Special notice letters will be issued in the near future under §122(e) of CERCLA. PRPs identified include Gerald Petery, Mary Ann Schuessler, and First Interstate Bank.

At present, technical discussions with PRPs have been limited to formal comments on the FS/Proposed Plan and related meetings. This information is included in the responsiveness summary and is part of the administrative record.

III. COMMUNITY RELATIONS

The following is a summary of community relations activities conducted by EPA for the SPT site, in order to meet the requirements under Sections 113(k)(2)(i-v) and 117 of CERCLA.

Dates	Activities
March/April 1985	EPA community relations (CR) representatives conducted community assessment interviews with interested community members in the Selma area.
July 1985	EPA distributed a fact sheet announcing the commencement of RI/FS work, and describing the RI/FS activities to the community.
July 1985	EPA held a community meeting in Selma to explain RI/FS activities that EPA was undertaking and to respond to the concerns. community's questions and concerns.

January 1986	EPA finalized the Community Relations Plan detailing the community concerns as expressed in the July 1985 community assessment interviews and communitty meeting.
March 1986	EPA distributed a fact sheet describing the purpose and nature of the monitoring wells placed in the Selma area. EPA also distributed a Spanish translation of this fact sheet.
May 1986	EPA Community Relations Coordinator met informally with community members to listen to their concerns and to explain current site activities.
July 1987	EPA distributed well sampling results to interested community members.
April 1988	EPA distributed a fact sheet detailing the results of the RI.
June 1988	EPA distributed a fact sheet explaining the contents of the FS Report and announcing the upcoming public comment period and community meeting.
June 22, 1988	EPA held a community meeting to explain the FS Report and to receive public comment on EPA's Proposed Plan for addressing the soil and groundwater contamination at the SPT site.
September 1988	Notice of this ROD, or Final Plan, will be published and made available to the public before commencement of the remedial action.

IV. SITE CHARACTERISTICS

The following discussions address contamination problems for the entire SPT site; there are no operable units (i.e., sub-investigations) for this site. All data were validated by Region 9, EPA, using standard review protocols and data quality was considered in analysis of the data and in reaching the decision.

A. Surface And Subsurface Soil Results

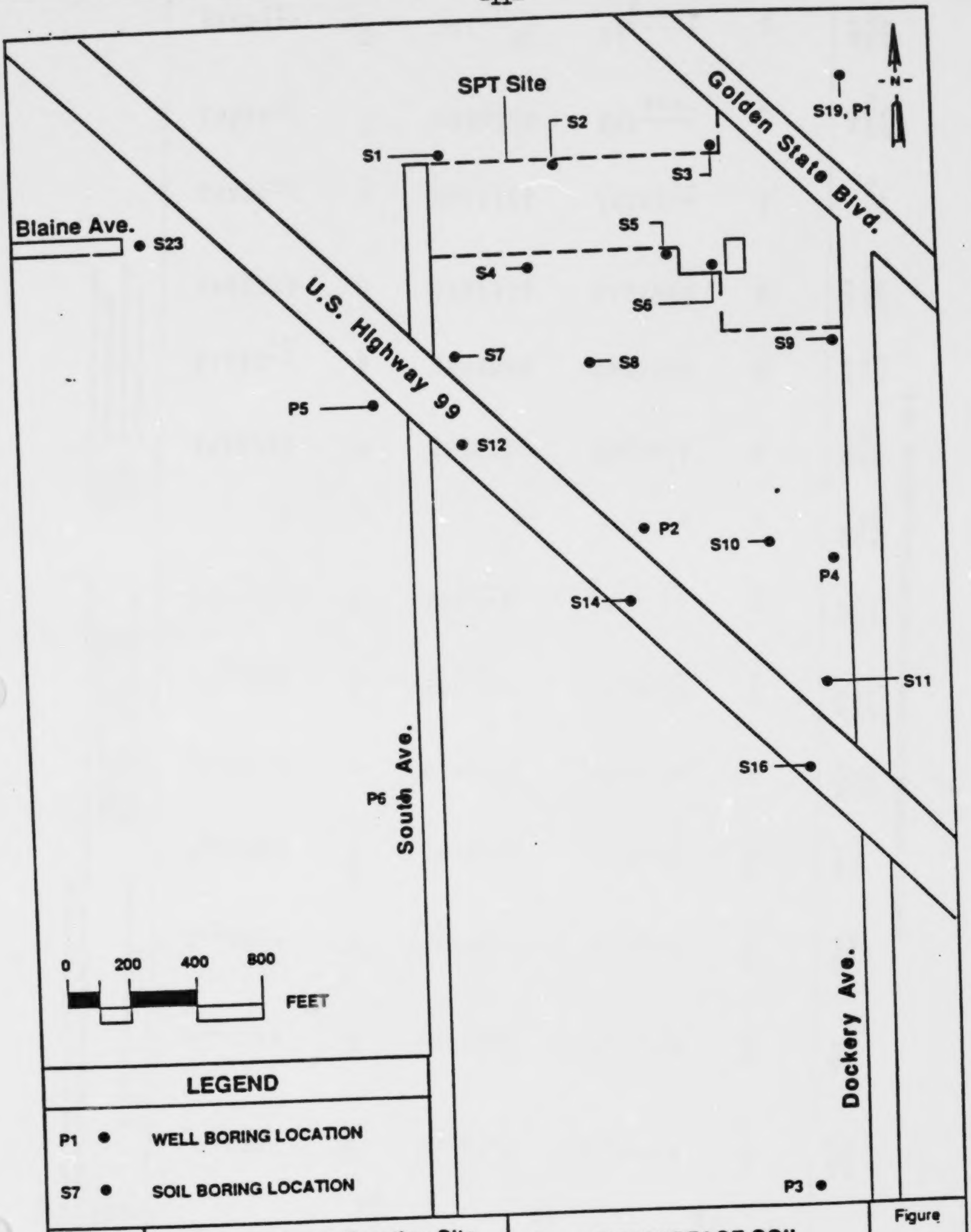
A total of 48 surface soil samples were collected during two rounds of sampling. The samples were collected from locations where waste was suspected to have been discharged, from known waste disposal areas, and from background locations. The samples were analyzed for a variety of constituents, including: An initial screening for Hazardous Substance List (HSL) volatiles, semi-volatiles and metals; hexavalent chromium; individual phenols; and dibenzodioxin/dibenzofuran (dioxin/furan) chlorinated tetra through octa homologs. A subsequent phase to confirm earlier results was performed and included analysis for isomer specific chlorinated dioxin/furans and metals. The site-related contaminants of concern found in surface soils included chromium, arsenic, copper, dioxin/furan, pentachlorophenol (PCP), and trichlorophenols (TCP).

A round of subsurface soil samples was collected at 21 boring locations during the RI field program (Figure 3). Samples were generally collected at the following depths: 1 to 2.5 feet (ft.), 2.5 to 4.0 ft., 4 to 5.5. ft., 10 to 11.5 ft., 15 to 16.5 ft., and 20 to 21.5 ft. (e.g. to the water table). The samples were analyzed for individual phenols, chromium, arsenic, and copper. Selected samples were also analyzed for the tetra through octa chlorinated dioxin/furan homologs, without identification of isomers. Chemicals of concern for the subsurface soils were the same as for the surface soils.

The soil sampling results identified seven areas where past practices resulted in levels of contamination above background concentrations that they warranted further evaluation. The seven soil contamination areas are the Waste Sludge Pit, North Unlined Percolation Ditch (Ditch A), South Unlined Percolation Ditch (Ditch B), Unlined Waste Disposal Pond, Drainage Area, Southeast Disposal Area, and Southwest Disposal Area. Table 1 provides the highest level for each of the contaminants of concern detected in each area of concern. Figure 4 identifies the location of each of the areas. The boundary of each area was based on the available sampling data and geographical features associated with each site.

These locations represent areas of concern due to the elevated levels of site-related contaminants detected at each of these sites. For example, high levels of arsenic, up to 4120 ppm, were detected at the Waste Sludge Pit. High levels of arsenic were also detected at the Unlined Waste Disposal Pond and Southeast Disposal Area. Elevated levels of dioxin/furan contamination, in tetra chlorinated dibenzodioxin (TCDD) equivalents, were detected at the former Unlined Waste Disposal Pond and the Southeast Disposal Area.

TCDD equivalents are a means of comparing the levels of dioxin/furan contamination in various locations. The toxicity of a particular dioxin/furan compound is


SPT Site
Golden State Blvd.
-N-
S19, P1
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
S14
S16
S23
P2
P3
P4
P5
P6
Blaine Ave.
U.S. Highway 99
South Ave.
Dockery Ave.
0
200
400
800
FEET
LEGEND
P1 ● WELL BORING LOCATION
S7 ● SOIL BORING LOCATION

Project No.	Selma Pressure Treating Site	SUBSURFACE SOIL SAMPLING LOCATIONS	Figure
123-FS1	Camp Dresser & McKee		3

TABLE 1 MAXIMUM CONTAMINANT CONCENTRATIONS FOUND IN SOILS

Location	Arsenic mg/kg	Chromium mg/kg	Copper mg/kg	PCP µg/kg	Total[1] TCP µg/kg	Total[1] Dioxins ng/g	Total[1] Furans ng/g	TCDD[2] EQUV ng/g	Total TCDD ng/g	Total TCDF ng/g	Total PeCDD ng/g	Total PeCDF ng/g	Total HxCDD ng/g	Total HxCDF ng/g
Waste Sludge Pit (Sample Sites W04, S34-S38)														
- Surface	4120	3910	1870	11000	R	283.8	56.6	.29	ND	ND	ND	ND	3.4	6.8
Unlined Percolation Ditch A (Sample Sites S1, S2, S3)														
- Surface	55	196	121	2100	R	130.2	40.1	.31	ND	ND	ND	0.7	3.4	5.4
- 1 to 2.5 ft.	ND	13	14	32	277	63.2	11.5		ND	ND	ND	0.05	0.71	1.7
- 2.5 to 4 ft.	22	9.7	9.6	34.9	4.9	32.9	2.7		ND	ND	ND	ND	0.21	1.1
- 4 to 5.5 ft.	23	9	10	365	14	40.3	10.1		ND	ND	ND	ND	0.85	1.3
- 10 to 11.5 ft.	3.2	8	7.3	21.1	80	2.5	0.48		ND	ND	ND	ND	NA	0.061
- 15 to 16.5 ft.	3.5	11	12	ND	ND	NS	NS		NS	NS	NS	NS	NS	NS
- 20 to 21.5 ft.	ND	12	18	43	38	1.0	0.18		ND	ND	ND	ND	ND	ND
Unlined Percolation Ditch B (Sample Sites S4, S5)														
- Surface	ND	12	17	ND	ND	7	2.5	.01	ND	ND	ND	ND	ND	ND
- 1 to 2.5 ft.	3.7	15	11	ND	10	0.9	ND		ND	ND	ND	ND	ND	ND
- 2.5 to 4 ft.	12	23	10	23.1	ND	0.8	0.1		ND	ND	ND	ND	ND	0.21
- 4 to 5.5 ft.	6.3	19	12	340	ND	12.5	2.5		ND	ND	ND	ND	ND	0.28
- 10 to 11.5 ft.	5.3	11	18	11.4	13	0.2	ND		ND	ND	ND	ND	ND	NA
- 15 to 16.5 ft.	ND	13	8.3	26	ND	NS	NS		NS	NS	NS	NS	NS	NS
- 20 to 21.5 ft.	ND	12	12	ND	41	ND	ND		ND	ND	ND	ND	ND	ND
Unlined Waste Disposal Pond (Sample sites W03, S29 - S33)														
- Surface	850	879	553	460,000	R	1228.7	634	5.65	ND	ND	ND	11.9	117	232
Southwest Disposal Area (Sample site S7)														
- Surface	21	24	9	ND	ND	1253.7	361.9	.29	ND	0.12	ND	2.8	12.7	64.7
- 1 to 2.5 ft.	31	31	5.6	ND	3	621.3	119.7		ND	0.19	ND	1.0	7.3	24.6
- 2.5 to 4 ft.	25	15	ND	ND	ND	21.1	0.7		ND	ND	ND	ND	ND	0.11
- 4 to 5.5 ft.	28	11	ND	ND	ND	2.64	ND		ND	ND	ND	ND	ND	ND
- 10 to 11.5 ft.	9.9	8.9	6.3	ND	ND	1.7	ND		ND	ND	ND	ND	ND	ND
- 15 to 16.5 ft.	17	6.7	5.1	ND	ND	NS	NS		NS	NS	NS	NS	NS	NS
- 20 to 21.5 ft.	8.8	7	ND	234	8.0	0.1	ND		ND	ND	ND	ND	ND	ND

N/A Not Available
ND Not Detected
NS Not Sampled

R: Data Rejected during data validation

TCDD: Tetrachlorodibenzo-p-dioxins
TCDD EQUV: TCDD equivalents
TCDF: Tetrachlorodibenzofurans

PeCDF: Pentachlorodibenzofurans
HxCDD: Hexachlorodibenzo-p-dioxins
HxCDF: Hexachlorodibenzofuran
PeCDD: Pentachlorodibenzo-p-dioxins

[1] Total dioxin/furan analysis includes Tetra through Octa homologs, of which the Octa homolog is considered innocuous.
[2] TCDD Equiv. are based on both the isomer specific and homolog data.

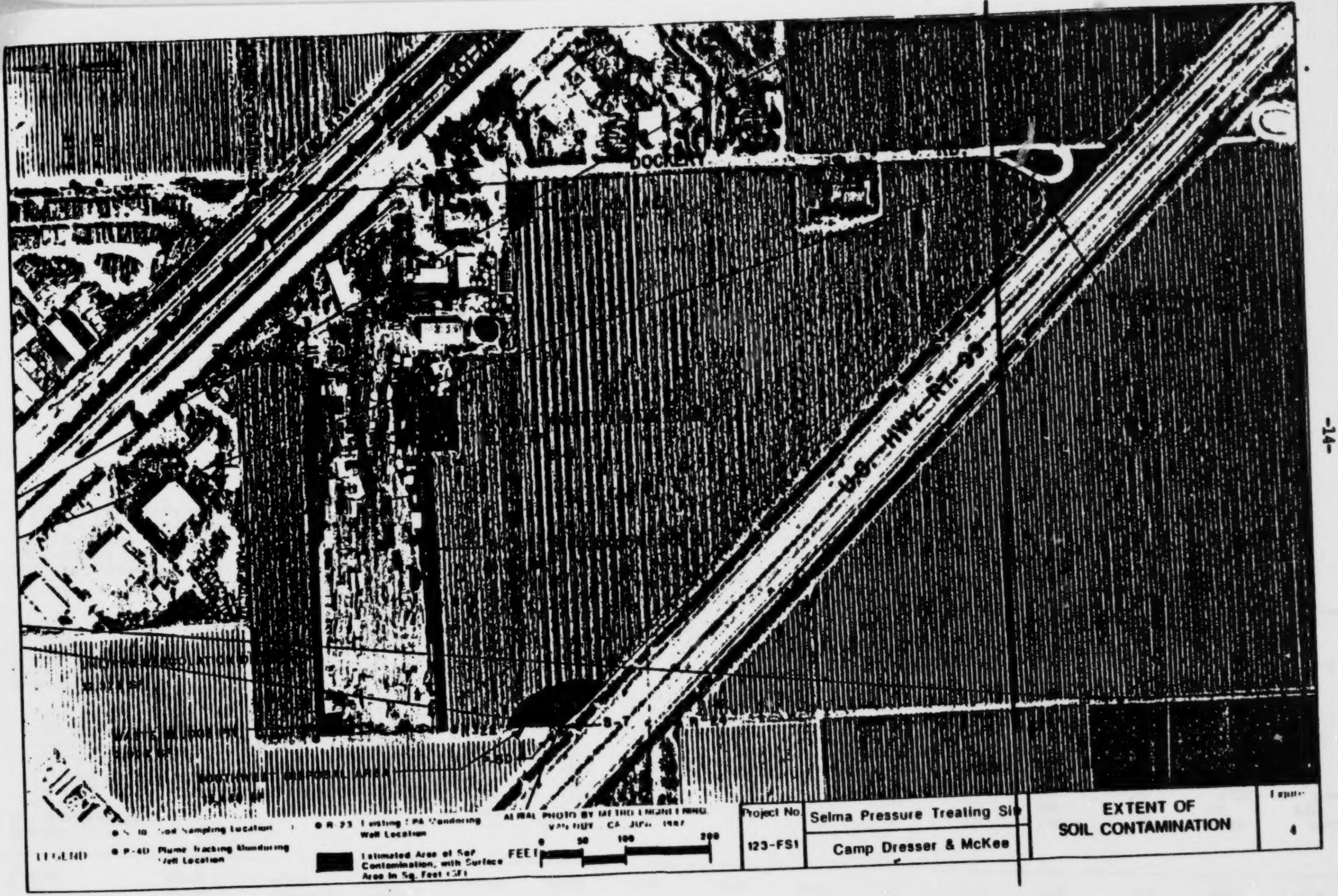
TABLE 1 MAXIMUM CONTAMINANT CONCENTRATIONS FOUND IN SOILS (continued)

Location	Arsenic mg/kg	Chromium mg/kg	Copper mg/kg	PCP µg/kg	Total[1] TCP µg/kg	Total[1] Dioxins ng/g	Total[1] Furans ng/g	TCDD[2] EQUV ng/g	Total TCDD ng/g	Total TCDF ng/g	Total PeCDD ng/g	Total PeCDF ng/g	Total HxCDD ng/g	Total HxCDF ng/g
Drainage Area (Sample site S9)														
- Surface	12.2	25	15	ND	ND	28.3	6.8	.03	ND	ND	ND	ND	0.38	0.64
- 1 to 2.5 ft.	5.0	21	7.7	ND	ND	0.5	0.1		ND	ND	ND	ND	ND	ND
- 2.5 to 4 ft.	14.0	14	17	ND	ND	13.2	2.0		ND	ND	ND	ND	0.052	0.16
- 4 to 5.5 ft.	13.0	10	12	ND	ND	11.4	.77		ND	ND	ND	ND	ND	ND
- 10 to 11.5 ft.	2.7	ND	9.2	ND	ND	0.6	ND		ND	ND	ND	ND	ND	ND
- 15 to 16.5 ft.	R	ND	7.4	ND	ND	NS	NS		NS	NS	NS	NS	NS	NS
- 20 to 21.5 ft.	1.4	7.1	13	ND	ND	0.3	ND		ND	ND	ND	ND	ND	ND
Southeast Disposal Area (Sample sites W05, S39 - S44) - Surface	467	390	422	200,000	92	2316.5	2214.2	1.62	ND	ND	ND	8.2	45	86.2

N/A Not Available	R: Data Rejected during data validation	TCDD: Tetrachlorodibenzo-p-dioxins	PeCDF: Pentachlorodibenzofurans
ND Not Detected		TCDD EQUV: TCDD equivalents	HxCDD: Hexachlorodibenzo-p-dioxins
NS Not Sampled		TCDF: Tetrachlorodibenzofurans	HxCDF: Hexachlorodibenzofuran
			PeCDD: Pentachlorodibenzo-p-dioxins

[1] Total dioxin/furan analysis includes Tetra through Octa homologs, of which the Octa homolog is considered innocuous.

[2] TCDD Equiv. are based on both the isomer specific and homolog data.


DOCKERY
U.S. HWY. RT. 99
LEGEND
● S-10 Soil Sampling Location
● P-4D Plume Tracking Monitoring Well Location
● R-23 Existing EPA Monitoring Well Location
Estimated Area of Soil Contamination, with Surface Area in Sq. Feet (SF)
AERIAL PHOTO BY METRO ENGINEERING, VAN NUYS, CA JUNE 1987
FEET
0
50
100
200

Project No.	Selma Pressure Treating Site
123-FS1	Camp Dresser & McKee

EXTENT OF SOIL CONTAMINATION

Figure 4

dependent upon the degree of chlorination at the 2,3,7,8, position. The exception to this is the octa chlorinated dioxin/furan homologs, which are considered innocuous. The remaining tetra through hepta isomers have various degrees of toxicity. In order to assess the potential toxicity associated with the dioxin data, each sample was evaluated with respect to 2,3,7,8 TCDD equivalents. This involves converting each dioxin/furan homolog into TCDD equivalents based on the EPA approved methodology using Toxicity Equivalent Factors (TEF).

Due to the lack of vertical extent data in source areas, an estimate of vertical extent of contamination was made to calculate volumes of soil requiring cleanup. The metal contamination in the soil was assumed to extend to a depth of 20 feet, which corresponds to the approximate depth of the water table. This assumption is based on the results of the groundwater sampling, which show elevated levels of chromium in the shallow portions of the aquifer. Dioxin/furan contamination is assumed to extend to 10 feet in depth based on available subsurface sampling results from various boring locations, which indicate that dioxin/furan contamination reaches permissible levels within the first 10 feet. This is evident from Table 1 which indicates that dioxin was detected in trace levels in only one soil sample taken from below 10 feet. Additional soil borings will be collected during RD/RA to refine this information on vertical extent of contamination.

The site-related surface and subsurface soil contaminants have variable mobilities in the environment. For example, dioxin/furan compounds have very low solubilities and are extremely immobile in the soil. Copper is also not very mobile in the environment due to its strong affinity for clays, hydrous metal oxides, and soil organic matter. Trivalent chromium has similar sorption characteristics to copper, and as such, tends not to be very mobile. Hexavalent chromium is very soluble and highly mobile in the environment. Furthermore, hexavalent chromium is not easily sorbed on the soil. However, hexavalent chromium is only stable under oxidizing conditions and will form trivalent chromium in a reducing environment. In regard to PCP and arsenic, these compounds can be relatively mobile under high pH environments. However, these compounds appear to be relatively immobile at the SPT site due to the general lack of observed levels in the groundwater.

B. Soil Clean-up Goals and Areas Requiring Remediation

Of the organic contaminants at SPT, the site-specific risk assessment indicated that dioxin/furan would drive the clean-up goals. The clean-up goal selected for dioxin/furan contaminated soil is 1.0 ng/g (ppb), in

TCDD equivalents. This clean-up goal is based on a TCDD risk study performed by Kimbrough, et al. (1984) of the Centers For Disease Control (CDC). This study is the basis for EPA policy and clean-up goals at Superfund sites where there is dioxin contamination. The 1 ppb goal is for areas where potential residential or agricultural uses could occur. While the SPT site is currently used for industrial purposes, the 1 ppb goal was selected due to the proximity of residences and agricultural activities to the site.

The heavy metals of concern at SPT are arsenic, chromium, and copper. Based on the health risk assessment, the metals clean-up goals were driven by arsenic. However, the primary basis for the metals clean-up goals will be the protection of groundwater. The selected 50 ppm arsenic goal assumes solubility and attenuation factors which are being verified by collecting more data. During remedial design (RD), data to evaluate the solubility of the soil contaminants and establish a site-specific attentation factor may indicate that both the arsenic and chromium clean-up goals need to be modified in order to provide adequate protection of the groundwater. A modification in the clean-up goals could result in a change in the volume of soil requiring remediation.

The 50 ppm arsenic goal is protective of all direct contact scenarios except new, on-site residential development. Institutional controls are required to prevent on-site residential development.

As stated previously, seven areas of contaminated soil were identified at SPT (see Figure 4). The clean-up goals indicate that four of these areas require remediation. The four areas proposed for clean-up are the Waste Sludge Pit, the Unlined Percolation Ditch A, the Unlined Waste Disposal Pond, and the Southeast Disposal Area.

Sampling results for three other areas indicate that contamination levels are below clean-up goals. These three areas are the Unlined Percolation Ditch B, the Drainage Area, and the Southwest Disposal Area.

C. Groundwater Results

The hydrogeologic setting for the area consists of valley-fill sequence due to the deposition of sediments from the adjacent Sierra-Nevada highlands. The depositional environment results in discontinuous geologic units. The exception to the discontinuous nature of the units is a five to ten foot clay layer located at a depth of approximately 55 to 60 feet below ground surface, which appears to be continuous or semicontinuous across the site. Additional data will be collected during remedial design to verify the continuity of the clay layer. The groundwater directly underlying the site is an unconfined aquifer.

Three rounds of groundwater samples were conducted in the vicinity of the SPT site. The first round of sampling occurred in April-May 1986 and included several regional domestic and irrigation wells, as well as five existing EPA monitoring wells installed by the EPA Environmental Response Team (ERT). The second round of sampling was performed in February-March 1987. This round included the sampling of the five existing EPA monitoring wells and the ten newly installed plume tracking monitoring wells. A third round of sampling occurred in July-August 1987 and included all of the monitoring wells and selected regional wells. The analyses performed for each round were as follows:

1. First Round, April-May 1986:

   Individual phenols (Method 604)
   Routine Analytical Services (RAS) Metals
   General water quality parameters

2. Second Round, February-March 1987:

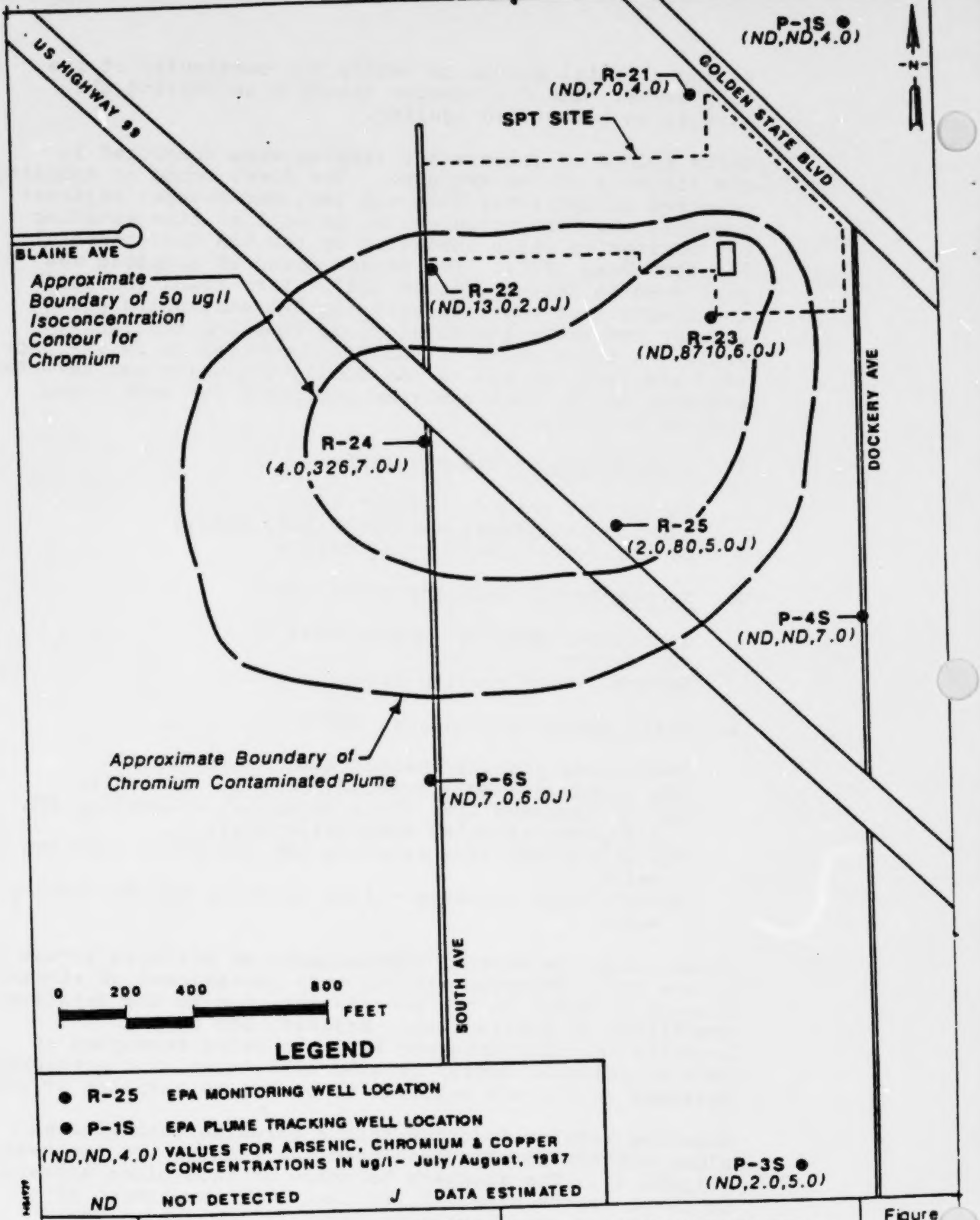
   Individual phenols (Method 604)
   RAS Metals
   General water quality parameters

3. Third Round, July-August 1987:

   Individual phenols (Method 604) - all wells
   Dissolved chromium, arsenic, copper - all wells
   Target Compound List (TCL) Volatiles - existing EPA and plume tracking monitoring wells
   TCL Semivolatiles - existing EPA and plume tracking wells
   Dioxin/furan homologs - five existing EPA monitoring wells

While there are several contaminants at elevated levels in the soil, chromium was the only contaminant of significance detected in the groundwater, due to the relative immobility of dioxin/furan, arsenic, and copper. Organics (dioxin/furan and PCP) are being resampled as part of remedial design related activities, but previously detected levels are believed to be due to sampling errors.

Sampling results indicate that a chromium contaminated plume extends downgradient from the site to the southwest (Figure 5). The southern boundary of this plume appears to range approximately 1,200 feet south-southwest of the existing wood treatment facility boundary. The groundwater contamination is apparently confined to


US HIGHWAY 99
GOLDEN STATE BLVD
P-1S
(ND,ND,4.0)
N
R-21
(ND,7.0,4.0)
SPT SITE
BLAINE AVE
Approximate Boundary of 50 ug/l Isoconcentration Contour for Chromium
R-22
(ND,13.0,2.0J)
R-23
(ND,8710,6.0J)
DOCKERY AVE
R-24
(4.0,326,7.0J)
R-25
(2.0,80,5.0J)
P-4S
(ND,ND,7.0)
Approximate Boundary of Chromium Contaminated Plume
P-6S
(ND,7.0,6.0J)
SOUTH AVE
0
200
400
800
FEET
P-3S
(ND,2.0,5.0)

LEGEND

- ● R-25 EPA MONITORING WELL LOCATION
- ● P-1S EPA PLUME TRACKING WELL LOCATION
- (ND,ND,4.0) VALUES FOR ARSENIC, CHROMIUM & COPPER CONCENTRATIONS IN ug/l- July/August, 1987
- ND NOT DETECTED
- J DATA ESTIMATED

Project No.	Selma Treating Company Site	GROUNDWATER PLUME BOUNDARY MAP	Figure
123-RI1	Camp Dresser & McKee Inc.		5

the shallower portion of the aquifer (to 40'), and does not currently affect any municipal, private, irrigation, or industrial wells in the vicinity, based on the sampling results. Contamination was not detected in the deep monitoring wells at depths of 87-100'. However, contamination levels in the intermediate portions (40-60') of the aquifer have not yet been defined.

The extent of the chromium contaminated plume needs additional definition to the west and southwest of well R24. As part of remedial design, two well nests west and south of R-24 are planned. A well nest will consist of one shallow well (40') and one intermediate well (60').

Additional definition of the vertical extent of contamination within the groundwater plume is also planned as part of remedial design. Three intermediate level wells completed at depths of 60 feet will be paired with the existing shallow wells in this area.

Additional data will also be collected on the continuity of the clay layer present at a depth of 55 to 60 feet. This data will be collected during the monitoring well installation program described above.

Other monitoring well installation plans include a shallow monitoring well (40') downgradient of the Southeast Disposal Area, and an intermediate level monitoring well and two observation wells in the upgradient background area. Other groundwater characterization activities to be conducted as part of remedial design include:

1. Monthly water level measurements for one year
2. Quarterly water quality sampling for one year
3. Long-term aquifer testing
4. Efforts to locate and sample the original Brown and Caldwell monitoring wells

Based on evaluation of the data collected from the above described activities, a decision will be made regarding the need for any additional characterization.

D. Groundwater Cleanup Goals

The groundwater cleanup goal is the Maximum Contaminant Level (MCL) established under both the federal and state Safe Drinking Water Acts. Due to the fact that chromium was the only contaminant of significance detected in the groundwater, additive effects were not of concern. Therefore, it was possible to select an ARAR as a clean-up goal, rather than a risk assessment driven goal.

Currently the MCL pertinent to SPT is the 50 ppb level set for chromium. The federal MCL is proposed for revision to 100 ppb, however, the state 50 ppb standard will probably be in effect at the time of remedial action. The most stringent of the state or federal MCL in effect at the time of RD/RA will be used. For analyses in the Feasibility Study and Record of Decision, the 50 ppb MCL was assumed. The arsenic MCL of 50 ppb, is also an applicable ARAR for the SPT site. However, arsenic was detected only at levels well below the existing or proposed MCL.

The boundary of the groundwater plume exceeding the chromium clean-up goal is delineated in Figure 5. This boundary was based on the elevated chromium values observed in the shallow monitoring and plume tracking wells. The western extent of contamination was estimated, based on the observed trend of the plume in other areas. The extent of contamination in this area will be further defined during the RD phase, through the installation of additional monitoring wells, as discussed in the preceeding section.

The data collected from the deep plume tracking wells in the site vicinity indicate that the chromium contamination at a depth of 90-120 feet does not exceed the chromium clean-up goal of 50 ppb. The exact vertical extent of contamination that exceeds the clean-up goal in the intermediate portions of the aquifer will be further defined as part of the RD, as described in the preceeding section.

V. SUMMARY OF SITE RISKS

A. Chemicals Of Concern

Data collected during the RI were reviewed to select a subset of chemicals (chemicals of concern) for detailed evaluation in the risk assessment. Separate subsets were selected for surface soils, subsurface soils (soil borings), and groundwater, in order to reflect the different exposure pathways associated with these different media.

A comparison of on-site and background levels of metals in surface soils, reveals that only arsenic, chromium, and copper appeared at elevated levels above background. Therefore these site-related chemicals were selected as chemicals of concern in surface soil, from among the metals. The organics of concern in the surface soil, identified in the risk assessment, were phenols, dioxins, furans, bis(2-ethylhexyl) phthalate, and di-n-butylphthalate. An analysis of subsurface soils produces the same subset of chemicals of concern, except that the phthalates were not included. The levels of arsenic and dioxin/furan contamination in the soil were the only constituents exceeding the health based clean-up goals.

Groundwater samples were collected from domestic, industrial, municipal, and irrigation wells, and from fifteen monitoring wells. Site-related chemicals detected were arsenic, chromium, copper, pentachlorophenol, and two dioxin congeners. Based on considerations of toxicity, concentration, and relations to site activities, arsenic, chromium, copper, and the dioxins were selected as chemicals of concern. However, only chromium exceeded the clean-up goals in groundwater.

B. Exposure Pathways

Potential human exposure pathways at the SPT site include exposure to contaminated groundwater, exposure via direct contact with contaminated soil (including incidental ingestion), and inhalation of contaminated dust. Based on data from existing private and municipal wells, risks associated with current use of groundwater in the vicinity of the site were evaluated. Using estimates based on data from monitoring wells and groundwater modeling, potential future risks associated with use of local groundwater as a potable supply were also evaluated. For soil, the EA evaluated exposure of individuals working at the site or in the vicinity of the site, local residents, and trespassers. Direct contact (dermal absorption or inadvertent ingestion) and inhalation were the exposure routes used. A number of scenarios involving these types of exposure were examined. Finally, a number of scenarios examining the potential exposure of off-site receptors to contaminants present in windborne dust also were evaluated using an air dispersion model.

C. Toxicity Of Chemicals Of Concern

Both the carcinogenic and noncarcinogenic effects of chemicals of concern used in the EA analysis are presented below. Exposure to arsenic has been associated with an increased incidence of cancer in humans. Chromium has been associated with an increased incidence of lung cancer in humans exposed via inhalation, but has not been associated with an increased incidence of cancer when exposure occurs via ingestion. Bis(2-ethylehexyl)phthalate and 2,4,6 trichlorophenol are classified as probable human carcinogens based on evidence from animal carcinogenicity bioassays. Certain dioxins and furans are considered to be carcinogenic by EPA and are also toxic to the reproductive system and the immune system.

Exposure to chromium via ingestion is associated with non-carcinogenic toxicity, including decreased water consumption, and at higher levels, gastrointestinal disturbances, liver damage, kidney damage, internal hemorrage, dermatitis, and respiratory problems. Many of these effects are thought to be due to chromium VI, not to chromium III. Exposure to copper, chlorophenol, cresols, di-n-butylphthalate, 2,4-dichlorophenol, 2,4-dinitrophenol, 2- and 4-nitrophenol, pentachlorophenol, and phenol have been associated with a variety of systemic, noncarcinogenic effects in humans or experimental animals.

D. Risk Characterization

A quantitative assessment of potential risks posed by contaminants in the vicinity of the SPT site was performed. The potential for endangerment of human health under a number of current-use and future-use exposure scenarios was evaluated. For each exposure scenario evaluated, two exposure cases, an average and a plausible maximum case, were considered. For the average exposure case, mean concentrations are used together with what are considered to be the most likely (though conservative) exposure conditions. For the plausible maximum case, the highest measured concentrations are used, together with high estimates of the range of potential exposure parameters relating to frequency and duration of exposure and quantity of contaminated media contact.

To summarize the risk assessment, carcinogenic risks at SPT may be associated with exposure to surface soil contaminants and airborne particulates under current use scenarios. Under future use scenarios, exposure to groundwater contamination may pose both a carcinogenic and noncarcinogenic risk. Risk results for both the current-use and future-use scenarios are discussed below. The risk numbers are presented for carcinogenic risks greater than 1 x 10^{-6} or where the Chronic Daily Intake (CDI) exceeded the Reference Dose (RfD) for noncarcinogenic risks. Generally, at SPT these risks are associated with the plausible maximum scenario, rather than the average case.

1. Current-use scenarios: Under current-use scenarios, exposure of workers and residents to surface soil contaminants in the adjacent vineyard, through dermal adsorption and incidental ingestion, and inhalation were considered a carcinogenic risk. The plausible maximum risk associated primarily with exposure to arsenic and dioxin/furans was 3 x 10^{-4}, or the risk of three excess cancer cases during a lifetime exposure of 10,000 individuals.

   The plausible maximum cancer risk from exposure of trespassers to surface soil contaminants at the wood treating facility was 2 x 10^{-5}. For workers, the average risk was 6 x 10^{-6} and the plausible maximum risk was risk was 4 x 10^{-3}. Again this risk is associated primarily with exposure to arsenic and dioxin/furans.

The plausible maximum risks due to inhalation of contaminated dust are associated primarily with exposure to arsenic and chromium. The risk ranges from 1 x 10^{-5} to 5 x 10^{-6} for locations 250 meters north and south of the site and 500 meters southeast of the site.

Under current-use conditions, groundwater as a potable supply is not expected to be a potential health concern, since the CDI is less than the RfD. This is based on exposure to chromium, which is a noncarcinogen by ingestion. The reason the current-use scenario has no risk is that no drinking water wells are currently within the groundwater plume boundaries. Institutional controls are needed to ensure that no wells are drilled into the contaminated area for drinking water purposes, until remediation is completed.

2. Future-use Scenarios: Under future use conditions, use of the shallow groundwater as a potable supply may be a potential health concern under the plausible maximum scenario, where the CDI levels for chromium could be 49 times greater than the RfD.

   For the deep groundwater, risk assessment based on a mass balance model indicated that the CDIs for several of the noncarcinogenic contaminants of concern could exceed their corresponding RfDs under both the average and plausible maximum scenarios. This is due to the potential for future leaching of contaminants, such as chromium, out of the soil into the groundwater.

   Under the mass balance model, excess cancer risks associated with exposure to carcinogenic contaminants (primarily background arsenic) was estimated to be 3 x 10^{-2}. However, arsenic is not expected to be highly mobile at SPT, based on observed levels in groundwater. The mixing model used to derive the risk number did not account for attenuation of contaminants in the environment and represents a very conservative estimate of the potential future risk associated with groundwater use. Because of this, arsenic was not retained as a chemical of concern in the formulation of groundwater remediation alternatives in the FS.

   Under future use scenarios, direct contact with soil contaminants or inhalation of contaminated particulates over relatively short periods of time by on-site construction workers, are not expected to be a potential health concern. This is the case for exposed individuals under either average or plausible maximum cases.

E. Analytical Methods Used

The Endangerment Assessment for the SPT site generally followed the guidelines established by EPA for risk assessments under CERCLA (EPA 1985a, 1986a) and for health risk assessments in general (EPA 1986b,c,d). The purpose of the assessment was to evaluate the No Action Alternative. The assessment was based on data generated under the EPA contract laboratory program (CLP).

VI. DOCUMENTATION OF SIGNIFICANT CHANGES, Section 117(b)&(c) of CERCLA

The preferred alternative in the Proposed Plan is the same as the remedy selected in this ROD: Soil fixation with a RCRA cap and conventional groundwater treatment. No significant changes are proposed at this time. Additional data collection activities that will occur as part of remedial design could impact information contained in the ROD.

VII. DESCRIPTION OF ALTERNATIVES

A. Alternative 1 - No Action

This alternative involves taking no action to treat, contain, or remove the contaminated groundwater and soil. Multi-media monitoring would be performed every five years to support a reassessment of the No Action Alternative. The costs for this alternative are as follows:

Capital cost	$18,000
Operation and maintenance (O&M) cost (annual)	$22,000
Present worth (life of project at 8% discount and 4% inflation rates)	$90,000

B. Alternative 2 - RCRA Cap with Slurry Wall

Alternative 2 is a containment alternative. The function of the multi-layer RCRA Cap is to prevent direct contact with soil by humans and wildlife, and to minimize the potential for airborne contamination. In addition, the low permeability Cap reduces infiltration and leaching of contaminants from the soil into the groundwater. The Cap would be constructed over the areas of contaminated soil that exceed the cleanup goals. Approximately 33,300 square feet of Cap would be required to cover these areas, based on the current clean-up goals. The Cap would meet the RCRA closure requirements under

40 C.F.R. §264, Subparts F, G and N. An example of Cap construction according to EPA closure guidance would be:

1. A 2 foot clay layer with hydraulic conductivity no greater than 1 x 10^{-7} cm/sec.
2. A minimum 20 mil High Density Polyethylene (HDPE) geomembrane.
3. A one-foot sand layer with a hydraulic conductivity of 1 x 10^{-3} cm/sec and filter fabric.
4. A two foot top soil layer.

Capping does not eliminate the leaching of contaminants from the untreated waste left on-site. Fluctuating groundwater levels may cause groundwater contact with contaminated soils. This may result in additional contamination at levels above the MCL, particularly for chromium.

The groundwater component of this alternative is to install a slurry wall to isolate the contaminated groundwater from the uncontaminated portion of the aquifer. A 1,375 foot long wall would be keyed into a clay layer at a depth of 55 feet. Approximately 75 million gallons of contaminaated groundwater is estimated to need containment. Extraction wells would be placed inside the slurry wall to maintain the hydraulic gradient toward the contaminated groundwater being contained. Monitoring wells would be located downgradient and outside the slurry wall in order to evaluate the effectiveness of the wall over time. The risks of leaving contaminated groundwater in the aquifer would be potential exposure of users to water that does not meet the drinking water standards. Therefore, institutional controls to prevent such use are required.

The major limitation associated with the slurry wall is that the clay layer proposed for its base may not be thick or continuous enough to support the wall. Additional investigation of this clay layer would be needed to support this alternative.

The aquifer in the Selma area is currently classified under EPA's Groundwater Protection Strategy, as a Class II A aquifer, which is currently used for drinking water and other beneficial uses. Also, the Fresno area has a designated Sole Source Aquifer under the Safe Drinking Water Act, 42 U.S.C. §1424(e). Alternative 2 would not be consistent with protection of this groundwater resource, due to the continued exceedences of the MCL for chromium and the potential for continued leaching of chromium or other constituents from the soil.

Under Alternative 2, implementation requirements include obtaining permission for use of private property during Cap and slurry wall construction. The slurry wall would require permanent easements or private property acquisition along its alignment. Off-site treatment and disposal options for the extracted groundwater would need to be evaluated.

Long-term institutional controls would be implemented to prevent access by unathorized persons to the capped areas, including fencing, signs and other land use restrictions. Long-term access to capped areas, extraction wells, and monitoring wells would be needed by government officials or representatives to ensure O&M activities could occur. Finally, long-term institutional controls would be needed to prevent the use of the contaminated portions of the aquifer as a drinking water supply.

The implementation timeframe for Alternative 2 would be approximately two months for RCRA Cap construction and seven months for slurry wall construction, after property access agreements have been obtained.

Costs for Alternative 2 are as follows:

Capital:	$2,180,000
O&M:	$40,000
Present worth:	$2,390,000

C. Alternative 3 - Soil Fixation with a RCRA Cap and Conventional Groundwater Treatment

For soils, Alternative 3 has both treatment and containment components. The function of soil fixation, as treatment, is to create a monolithic soil matrix which inhibits leaching, using a stabilization and solidification process. The RCRA Cap, placed on top of the fixed soils would provide additional protection from surface disturbance and surface water infiltration. The waste to be treated is contained in the areas where the soil constituents exceed cleanup goals. Also, under this alternative, six dry wells will be evaluated and abandoned, as appropriate.

The arsenic and chromium contamination is considered a RCRA characteristic waste under 40 C.F.R. §261.24. The dioxin and PCP waste is considered a RCRA K001 listed waste under 40 C.F.R. §261.32. Once excavated, substantive RCRA standards for treatment, storage and disposal of these wastes under 40 C.F.R. §264 apply. In addition, disposal of K001 waste is regulated under 40 C.F.R. §268, Land Disposal Restrictions, since placement has occurred. The volume of contaminated soils requiring treatment total approximately 16,100 cubic yards of material. Volume estimates will be further refined during remedial design, and should be considered estimates here.

The typical on-site fixation operation includes a batch plant for mixing the fixative agent (cement, silicate materials, and additives), and conventional construction equipment for excavating and backfilling the soil. The batch plant and staging area for temporary storage of contaminated soils is proposed for a 1.5 acre area in the northwest corner of the SPT site. The staging area will comply with RCRA regulations under 40 C.F.R. §264, Subpart L - Waste Piles, calling for temporary double synthetic liners and a double leachate collection system. The temporary waste and storage facilities will also need to comply with the construction standards for Class I waste piles in Title 23, Subchapter 15, California Code of Regulations (CCR). Cap construction will be as outlined for Alternative 2, and will meet the same RCRA applicable or relevant and appropriate requirements (ARARS).

The fixed soil will meet the leachablity requirements for the appropriate site-specific constituents under RCRA. The maximum concentration of arsenic and chromium characteristic wastes, using EP toxicity, is 5 mg/l under 40 C.F.R. §261.24. It is predicted that fixation will meet land disposal restriction level under 40 C.F.R. §268, of 37 ppm for PCP, using a total waste analysis test.

Also, as discussed previously, soils will be tested during remedial design to determine the soluble fraction of the contaminants and the attenuation factor. Based on this testing, treatment goals needed to protect groundwater will be evaluated by EPA and the RWQCB. The RWQCB recommends site-specific cleanup goals under the authority of the Porter Cologne Water Quality Control Act California Water Code §§13000 et seq.

Under Alternative 3, residual levels of arsenic, dioxin/furan, chromium, copper, and phenols below the health risk-based cleanup goals would remain onsite, untreated. Based on the Endangerment Assessment for SPT it was determined that these residuals will not pose an unacceptable risk to public health or the environment. The solubility testing will ensure that residual levels do not pose a risk to groundwater.

There is a potential for the future breakdown of the monolithic soil matrix. To reduce this potential the fixed soils will be covered with a Cap that meets the RCRA requirements as described under Alternative 2. Long-term monitoring will also be performed to meet the substantive RCRA requirements for closure under 40 C.F.R. §264, Subpart F, G and N.

For the groundwater component of Alternative 3, a conventional precipitation, coagulation, and flocculation process is proposed to remove chromium to the MCL level. Based on the assumption of a 50 ug/l MCL and a two dimensional model, the volume of extracted groundwater requiring treatment is estimated at 2.7 billion gallons. This estimate will be further defined during the remedial design phase of the project, based on additional aquifer testing and monitoring well installation.

Based on the estimate discussed above and the distribution of the plume, approximately 25, 6-inch diameter extraction wells, 50 feet deep will be pumped at a cumulative total of 1,040 gallons per minute for five years. This assumes a treatment plant operating 24 hours a day, seven days a week, with an online availablity of approximately 95%. The five year timeframe is based on several assumptions regarding estimates of extent of contamination, the number of extraction and injection wells, and the volume of groundwater requiring treatment. Specific timeframes will be further defined as part of RD. A range of 5-10 years may be more realistic, depending on the results of data collected during RD.

The treatment facility will consist of an influent storage tank, a rapid mix unit, a slow mix unit, a sedimentation tank, a filter, a treated effluent storage area, and associated piping, valves, and pumps. This facility proposed for location in the vineyard south of the wood treating facility, will occupy approximately 1/2 acre.

Based on satisfactory treatment and testing of the groundwater, either reinjection or off-site disposal will occur. If reinjection is appropriate, approximately 35, 4-inch diameter recharge wells will also be distributed throughout the aquifer.

The treatment level to be achieved is the more stringent of the federal or state Safe Drinking Water Act Maximum Contaminant Levels. Currently this level is 50 ppb, under both federal and state law. Residual untreated groundwater would not exceed the MCL. Residual treated groundwater would either be reinjected or disposed of off-site. For reinjection, substantive requirements of the Safe Drinking Water Act 42 U.S.C. §§1421-1422, 40 C.F.R. §§144-147, would be met. For off-site disposal, the RWQCB would establish discharge limits consistent with requirements under the National Pollutant Discharge Elimination System (NPDES) program. The reinjection of treated groundwater will also be regulated by substantive RWQCB waste discharge requirements to provide protection of the beneficial uses of the underlying groundwater.

The sludge generated from the treatment facility will be dried in lagoons on two acres adjacent to the treatment facility. The sludge will be disposed of at an approved off-site RCRA facility or municipal landfill, depending on sampling results. The sludge lagoons will be constructed to RCRA standards as set forth in 40 C.F.R. §264 - Subpart K - Surface Impoundments, which require two or more liners and a leachate collection system. Synthetic liners are proposed for use at SPT. The sludge lagoons will also need to meet the construction criteria in Title 23, Subchapter 15 of the CCR, regulated by the RWQCB. Other options, for sludge drying, such as mechanical methods, will be considered during the design phase.

Regarding implementation requirements for soil remediation activities under Alternative 3, equipment and materials for Cap construction are readily available. Treatability testing is required for soil fixation, and is currently being performed. There are numerous commercial enterprises involved in developing and marketing fixation technology. Sixteen companies were identified in a vendor survey as capable of providing expertise in treating metals and organics with solidification and stabilization processes. Access to private property will be needed for the batch plant and staging areas.

Short-term worker protection during soil excavation will be required, consistent with federal and California Occupational Safety and Health Act (OSHA and Cal OSHA) standards. EPA currently has federal-lead jurisdiction for worker protection at wood treating facilities. However, EPA has adopted OSHA standards for use at these sites. Excavation, storage, and fixation of soil are also subject to Fresno Air Pollution Control District (APCD) Rules 210.1, 404, 405, and 418. Discharges during remediation could include: (1) fugitive dust containing toxic metals and toxic organics, and (2) volatile toxic organics. Requirements of the Clean Air Act, 42 U.S.C. §7401 et seq, are incorporated into APCD Rules, per Section 110 of the Clean Air Act.

For the groundwater component, implementation requirements include disposal of treatment residuals, utility requirements, access to private property for the treatment plant and sludge lagoons, treatability studies for waste stream characteristics, and disposal of treated water. Significant implementation obstacles are not foreseen.

The main uncertainty regarding Alternative 3 is the implementability of soil fixation based on treatability testing. If this test is not successful, it will be necessary to select a different alternative to remediate SPT site soils.

The groundwater classification is Class II A, and implementation of Alternative 3 would be consistent with maintaining the use of the aquifer for drinking water and other purposes.

Short-term institutional controls include limiting access to the staging area, treatment areas, and sludge drying beds, through use of fencing, signs and security. Until remediation of groundwater is achieved, institutional controls over the use of the contaminated portions of the aquifer will be required. Long-term institutional controls include access restrictions to capped and fixed areas, and long-term access for monitoring and maintenance activities.

The implementation timeframe for Alternative 3 is approximately 12-18 months for the soil component and 5-10 years for groundwater treatment.

Costs associated with Alternative 3 are estimated as follows:

Capital:	$ 6,500,000
O&M:	$ 1,300,000
Present Worth:	$11,280,000

D. Alternative 4 - On-site Rotary Kiln with Off-site Disposal and Conventional Groundwater Treatment

This alternative has both treatment and containment (disposal) components. The groundwater components are the same as described in Alternative 3 and will not be discussed further here. The soil treatment component applies to the organic constituents in the soil. An on-site rotary kiln would be used to incinerate dioxin/furan and pentachlorophenol wastes totalling 7800 cubic yards. Included with the organic wastes are metal constituents that would not be destroyed during incineration. In addition, there is another 8300 cubic yards of metals contaminated soil with no organic contamination. All of the soils, treated and untreated (a total of 16,100 cubic yards), would be disposed of at an off-site RCRA facility. The SPT wastes containing pentachlorophenol would require treatment (e.g., incineration) prior to disposal to meet the present RCRA Best Demonstrated Available Technology (BDAT) requirements of 37 ppm, under 40 C.F.R. §268. The untreated arsenic and chromium contaminated wastes are RCRA characteristic wastes and therefore require disposal at an approved RCRA Class I facility.

The mobile unit assumed for SPT is rated at 15 million BTU/hour and treats 4.50 tons/hour of dry solids. The primary (i.e., rotary kiln) and secondary (i.e., afterburner) combustion chambers are generally mounted on concrete slabs. Approximately .5 acres is expected to be required for stockpiling excavated soil, locating feed handling and preparation equipment, and temporary storage of decontaminated soil. Sufficient area for processing exists on the storage yard being used by the present wood treating operation.

For organics, treatment levels achieved would be the BDAT treatment level requirements for PCP of 37 ppm and the 1 ppb clean-up goal for dioxin/furan contamination. For the incinerator, 99.99% destruction and removal efficiency (DRE) is required under 40 C.F.R. §264, Subpart O, for the principal organic hazardous constituents (POHCs). The metals would remain untreated, and would either be captured in the air pollution control equipment or remain in the incinerated soil residuals.

If BDAT for metals under 40 C.F.R. §268 is in effect at the time of project implementation, then these levels would need to be met as well. For this ROD it is assumed that the incinerator soil residuals would require disposal at a RCRA Class I facility due to the metals content of the residue.

Under the California Air Resources Act, California Health and Safety Code §39650 et seq, the Air Pollution Control District (APCD) will set emission limits for discharges associated with use of the incinerator under APCD Rule 210.1, New Source Review. Rules 404, 405, 418 and 417 also apply to excavation and incinerator activities. Discharges associated with soil excavation may consist of: (1) fugitive dust containing toxic metals and/or toxic organics, and (2) volatile toxic organics. Compliance with APCD Rules includes Clean Air Act requirements.

Implementation requirements include access to a mobile rotary kiln, of which there may be a limited supply. Acceptance of SPT wastes at an off-site RCRA facility would be determined based on waste characteristics and BDAT requirements in effect at the time of waste disposal. Access to private property is required for the incinerator, groundwater treatment systems, and monitoring well installation activities. Pilot work would be necessary to aid in addressing materials handling requirements and to assess air emissions.

Alternative 4 would be consistent with the area's Class II A aquifer classification. The contaminated groundwater would be treated and contaminated soils would be removed. The removal of the contaminated soil would prevent the possibility of continuing migration of the contaminants to the groundwater. As stated previously, soil clean-up goals will be evaluated after solubility testing to ensure protection of groundwater quality.

Institutional controls include short-term access restrictions to the soil and groundwater treatment areas, and restrictions over the use of the contaminated portions of the aquifer for drinking water purposes. Long-term institutional controls are not needed for this alternative.

The soils remediation implementation timeframe for Alternative 4 would be 7-10 months at an incinerator unit operating 24 hours a day, seven days a week, with online availability of 80%. An additional 1-2 months would be required to demobilize equipment. Groundwater treatment is estimated to take 5-10 years.

Costs estimated for Alternative 4 include:

Capital:	$15,630,000
O&M:	$1,290,000
Present worth:	$20,360,000

VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Overall Protection of Human Health and the Environment

1. No Action: No protection is provided, although monitoring would provide a warning indicator of contaminant transport.

2. RCRA Cap with Slurry Wall: Partial protection is provided, with ongoing maintenance. The migration of contaminated groundwater is restricted from reaching uncontaminated portions of the aquifer. Direct contact with soils and generation of contaminated airborne dust is prevented. The Cap also limits infiltration of surface water and contaminant mobility. Institutional controls are necessary to prevent the use of contaminated groundwater exceeding primary drinking water standards. Continued leaching of capped soils due to groundwater fluctuations could exacerbate the chromium contamination problem.

3. Soil Fixation with RCRA Cap and Conventional Groundwater Treatment: For soil, protection is provided with ongoing maintenance. Cap protection features are the same as for Alternative 2. Addition of the fixative agent greatly reduces continued leaching of contaminants to groundwater, protecting potable water supplies from a continuing source of contamination. Groundwater treatment provides complete protection to the MCL cleanup level.

4. On-site Rotary Kiln and Off-site Disposal with Conventional Groundwater Treatment: For soil, complete protection is provided on-site. No contaminants exceeding the cleanup goals remain at SPT. Careful short-term incinerator operation would be

required to assure that significant adverse air quality impacts do not occur. For groundwater, the same complete level of protection is provided as for Alternative 3.

B. Compliance with ARARS

1. Alternative 1: Does not comply with MCLs for groundwater. No action would be taken to meet ARARS.

2. Alternative 2: Does not comply with MCL for chromium or Porter Cologne Water Quality Act cleanup goals for soils (a requirement "to be considered," rather than an ARAR). Would comply with RCRA requirements under 40 C.F.R. §264, Subparts F, G, and N.

3. Alternative 3: Will comply with all ARARS, including MCLs, RCRA BDAT for K001 listed waste, and RCRA closure requirements.

4. Alternative 4: Would comply with all ARARS identified at this stage, including MCLs, RCRA BDAT for K001 listed waste, and RCRA requirements for off-site disposal of waste.

C. Long-term Effectiveness and Permanence

1. Alternative 1: Not a permanent solution.

2. Alternative 2: Not a permanent solution. Long-term monitoring and maintenance activities are associated with the Cap. Groundwater is not treated. Long-term institutional controls would be required to ensure that drinking water wells are not located in the contaminated portions of the aquifer.

3. Alternative 3: For soil, full permanence cannot be assured due to limited experience with the fixation technology. Long-term maintenance and monitoring is required. Depending on the monitoring results, additional work could be required in the future if the monolithic soil matrix breaks down. For groundwater, a permanent solution.

4. Alternative 4: For soil, a permanent solution for organics (dioxin/furans and PCP); but not permanent for metals. Off-site disposal requires long-term O&M at the RCRA facility. For groundwater, a permanent solution.

D. Reduction in Toxicity, Mobility and Volume (TMV)

1. Alternative 1: Does not reduce TMV.

2. Alternative 2: Reduces mobility but not toxicity or volume.

3. Alternative 3: For soil, mobility significantly reduced, toxicity is not reduced, and volume is increased due to the addition of the fixative agent. For groundwater, TMV reduced.

4. Alternative 4: For soil, near complete reduction of toxicity and mobility for organics. For metals, reduces mobility only by removing contaminants from the site and containing them in a Class I RCRA facility. For groundwater, TMV reduced.

E. Short-term Effectiveness

1. Alternative 1: There would be no short-term impacts.

2. Alternative 2: Short-term impacts to workers associated with slurry wall and Cap construction would be minimal.

3. Alternative 3: Short-term exposure to workers during soil excavation and treatment, and groundwater well installation could occur. Worker safety precautions and dust suppression needed to protect workers and others onsite and in site vicinity.

4. Alternative 4: Short-term impacts would be comparable to Alternative 3. Differences include short-term potential for accidental spillage during off-site transport of wastes and exposure to incinerator emissions. Air pollution control equipment and careful transport required in addition to measures outlined in item 3, above.

F. Implementability

1. Alternative 1: No implementability factors are relevant.

2. Alternative 2: The technology for both the RCRA Cap and slurry wall are readily available. The technical feasibility of the slurry wall is questionable due to potential problems with inadequate thickness and continuity of the clay layer. Access problems associated with the slurry wall alignment may also arise.

3. Alternative 3: The RCRA Cap and conventional groundwater treatment technologies are readily available and proven. Property access/acquisition problems may arise for the well installation and treatment areas. Fixation technology requires site-specific treatability testing to verify effectiveness prior to use.

4. Alternative 4: Conventional groundwater treatment issues are the same as under Alternative 3, above. Use of incinerator requires prior on-site treatability testing in coordination with the local APCD. Off-site disposal of wastes requires acceptance by the receiving facility depending on actual waste characteristics analysis. Regulatory status governing off-site disposal of land ban wastes may influence disposal options at time of remedial action.

G. Estimated Capital, O&M, and Present Worth Cost

		CAPITAL	O&M	PRESENT WORTH
Alt 1	No Action	$18,000	22,000	90,000
Alt 2	Slurry Wall/ RCRA Cap	2,180,000	40,000	2,390,000
Alt 3	GW Treatment/ Fixation	6,500,000	1,300,000	11,280,000
Alt 4	GW Treatment/ Rotary-Kiln/ Off-Site Disposal	15,630,000	1,290,000	20,360,000

H. State and Community Acceptance

1. Alternative 1: Not acceptable to the state; no input was received from the community.

2. Alternative 2: Not acceptable to the state due to potential insufficiency of clay layer to key slurry wall into and because chromium remaining in soils under the Cap could leach to groundwater. No community input received.

3. Alternative 3: Acceptable to the state. Additional remedial design-related groundwater and soil sampling and treatability testing will be reviewed by the state for continued acceptance of remedy. No community comments received.

4. Alternative 4: State concerned about potential incinerator emissions-related public perception and regulatory approval problems. Incinerator pilot testing and remedial design-related sampling results would be reviewed by the state. No community issues raised at this time.

IX. THE SELECTED REMEDY

Alternative 3 - Conventional Water Treatment and Soil Fixation with a RCRA Cap, has been selected as the remedy for the SPT site. Remediation of the chromium contaminated groundwater under this alternative consists of pumping the groundwater from the aquifer, treating it in an on-site facility utilizing a conventional water treatment method, and disposing of the treated effluent through reinjection into the aquifer, or off-site, as appropriate.

The soil remediation component of this alternative consists of excavating the contaminated soil, transporting it to a processing plant onsite; "fixing" the soil with cement, silicate and other bonding agents; and then backfilling and compacting the fixed material on-site. Fixed areas of soil will then be covered with a RCRA Cap.

X. THE STATUTORY DETERMINATIONS

A. Protection of Human Health and the Environment

The selected remedy will eliminate risk of exposure to groundwater contaminated with chromium above MCL levels. The remedy will eliminate exposure to contaminated soil that exceeds groundwater and health based cleanup goals. In the case of soils, the contaminants will not be removed or destroyed. Long term O&M is required to ensure that the soil remedy is effective.

Adequate safety precautions will be used during construction and treatment activities. Therefore, unacceptable short-term impacts are not expected. Cross media impacts are also not foreseen associated with this remedy. Careful attention to drilling techniques will be paid to ensure that drilling will not contaminate the deeper, unaffected portions of the aquifer. Cleanup goals will take into account the potential leaching of soil contaminants into the groundwater. Careful dust suppression methods during all remedial activities will ensure that contaminants are not transmitted into the air at unacceptable levels during construction. The RCRA Cap will provide long-term protection agaist transmission of contaminated particulates into the air.

B. Attainment of ARARS

The selected remedy will attain the applicable or relevant and appropriate requirements determined to date; no ARARS waiver is necessary. The following are the main ARARS that have been determined to apply to the remedy:

Statute	Standard
Safe Drinking Water Act 42 U.S.C. §300A *et seq*; 40 C.F.R Part 141.	Maximum contaminant levels for chromium and arsenic in groundwater.
Safe Drinking Water Act 42 U.S.C. §300A *et seq*; 40 C.F.R. Parts 144-147.	Underground injection control requirements for Class V Wells, including dry wells.

Safe Drinking Water Act 42 U.S.C. §1424(e).	Prohibits any project with federal financial assistance from contaminating a Sole Source Aquifer.
Resource Conservation and Recovery Act 42 U.S.C. §6901 et seq; 40 C.F.R. Parts 257, 261, 262, 263, 264, 265, 268.	Practices to be followed by generators, transporters, owners and operators of hazardous waste. Standards for land disposal of certain restricted hazardous wastes.
California Safe Drinking Water and Toxic Enforcement Act. California Health and Safety Code §252.5 et seq.	The state MCL for chromium.
California Air Resources Act. California Health and Safety Code §39650 et seq.	Discharge limits for activities conducted during the remedial action. Includes Clean Air Act requirements.
Porter Cologne Water Quality Control Act. California Water Code §13000 et seq.	Waste discharge requirements, NPDES discharges, specific cleanup standards established on a site specific basis.
California "Superfund" Law - Hazardous Substances Account Act/ Hazardous Substances Cleanup Bond Act. California Health and Safety Code §25300 et seq.	Substantive requirements of a Remedial Action Plan (RAP).
California Occupational Safety and Health Act. California Laboratory Code §6300 et seq.	Standards for worker protection during remediation.
Occupational Safety and Health Act. 29 U.S.C. §651 et seq.	Under 40 C.F.R. §300.38, OHSA requirements apply to all activities conducted under the NCP.

C. Cost-Effectiveness

The selected remedy estimated at $11,280,000 is the least expensive of the remedies that meet the statutory criteria of protection of public health and the environment, and attainment of ARARS. For example, alternative 4, Conventional Water Treatment/Incineration and Off-site Disposal is estimated at $20,360,000; almost double the selected remedy. Alternative 2, slurry wall/RCRA Cap, is much less costly than the selected remedy at an estimated $2,390,000; but would not be protective of public health or meet ARARs.

D. Utilization of Permanent Solutions Employing Alternative Technologies to the Maximum Extent Practicable (MEP)

The selected remedy is an appropriate solution for the site. It will effectively treat groundwater contaminants, prevent contact with soil contaminants, and prevent leaching of contaminants to the groundwater at levels above the MCL. The remedy provides protection of public health, achieves ARARS compliance and is cost-effective.

In comparison, on-site and off-site RCRA disposal options are more problematic for soils at SPT than the chosen method of fixation. An on-site RCRA landfill would not meet RCRA or CCR siting criteria due to the site geology and presence of a Sole Source Aquifer. Since BDAT was not established for the dioxin K001 waste, it could conceivably be disposed of off-site, along with the metal contamination, without treatment. The PCP wastes would require treatment to the 37 ppm BDAT standard. However, straight off-site disposal of wastes does not comply with the intent of CERCLA for remedies that use permanent solutions and treatment to the maximum extent practicable. Finally, the regulatory status governing land disposal of SPT waste is in a state of development. It is not certain whether RCRA disposal facilities would accept SPT wastes at the time of remediation; and if so, what Best Demonstrated Available Technology (BDAT) would be required (BDAT may be promulgated for arsenic).

In regard to soil treatment methods, fixation and incineration were the only two that were deemed technically feasible in the FS screening process. Incineration, however, treats only the organic contents of the SPT waste, resulting in untreated metals requiring disposal. Fixation has been identified as a feasible technology for the low organic/high metals ratio in the SPT wastes. (Treatability testing will be performed to ensure that this method will effectively treat SPT wastes). The sandy-silty soil composition at SPT is also amenable to fixation.

Several nonthermal treatment process for removing soil contaminants at SPT were examined, including physical, chemical, and biological. Of the physical methods, (fixation and soil washing), soil washing was found not to be effective for removing the relatively low arsenic and chromium concentrations in the waste, and is not an effective remedy for organic wastes. For chemical methods, nucleophilic substitution, or KPEG, only applies to the organics and has not been demonstrated effective in removing the dioxin/furan concentrations to the 1 ppb level.

Biological treatment processes, both on-site and in-situ, were examined for soil treatment. Biological treatment applies only to the organic contaminants in the waste, and does not treat the metals. However, laboratory tests did not show reduction of dioxins to the 1 ppb level and no large scale pilot studies have been conducted on use of biodegradation for dioxin wastes.

For groundwater treatment, the metals-precipitation chromium removal technology selected for groundwater cleanup is a conventional and effective method commonly used in industrial processes. The other groundwater treatment method evaluated in detail was ion exchange. However, ion exchange processes would not be effective in treating site groundwater due to the potential for clogging of the resins. Clogging occurs as the trivalent chromium in the water will readily precipitate out of solution as chromium hydroxide. In addition, large quantities of brine are generated, increasing costs over conventional treatment without greater protection.

Therefore, in comparison to other possible technologies, soil fixation with a RCRA Cap and conventional groundwater treatment have been determined to be the most appropriate technologies for the SPT site.

For groundwater, the remedy selected is considered the maximum extent to which a permanent solution and treatment can be practicably utilized. For soil, full permanence cannot be assured due to limited experience with the fixation technology. Therefore, long-term monitoring is required. In terms of treatment, the contaminants are rendered immobile by application of the fixative agent. However, this form of treatment does not reduce contaminant volume or significantly reduce toxicity.

A fully permanent treatment solution for the combination of wastes present in the SPT soil was not determined to be feasible at this time. Therefore, the selected remedy represents the maximum extent to which permanent solutions and treatment can be practicably utilized.

RESPONSIVENESS SUMMARY
FOR THE
FEASIBILITY STUDY
SELMA PRESSURE TREATING COMPANY

INTRODUCTION

From June 3, 1988 through July 2, 1988, the U.S. Environmental Protection Agency (EPA) held a public comment period on EPA's draft Feasibility Study (FS) for the Selma Pressure Treating Company Superfund Site in Selma, California. The FS evaluates four alternatives for addressing soil and groundwater contamination. The purpose of the public comment period was to give interested parties the opportunity to comment on the FS. For this purpose, EPA held a community meeting in Selma on June 22, 1988.

EPA's purpose in conducting the FS was to evaluate relevant remedial action alternatives for selecting a remedy that is protective of human health and the environment for the soil and groundwater contamination identified at the site. The selected remedy also must attain Federal and State requirements that are applicable or relevant and appropriate, and be cost effective.

A responsiveness summary is required under EPA Superfund policy guidelines for the purpose of providing a summary of the issues of concern raised during the public comment period about the remedial alternatives contained in the FS. In addition to summarizing the concerns and questions raised by interested parties, the responsiveness summary presents EPA's responses to those concerns.

The responsiveness summary for the FS conducted at the Selma Pressure Treating Company site is divided into three sections:

I. Background on Community Involvement and Concerns. This section provides a brief history of community interest in and concerns about the Selma Pressure Treating Company site.

II. Overview of the FS. This section provides a brief history of the soil and groundwater contamination, summarizes the contents of the draft FS, and identifies EPA's preferred alternative.

III. Summary of Comments Received and EPA Responses. This section categorizes and summarizes written and oral comments received during the public comment period and provides EPA's responses to these comments.

Appendix A contains an index of comments received during the formal comment period, as well as a copy of these comments. These comments include issues raised at the public hearing and all written comments received by EPA during the public comment period on the FS.

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

This section presents a summary of community awareness about the site, community concerns expressed at the recent community meeting about the site, media coverage of site activities, and EPA community relations activities conducted to date.

A. History Of Community Awareness About The Site

General community awareness and concern about the Selma Pressure Treating Company (SPT) site first surfaced when two local newspapers focused media attention on groundwater contamination from the site. The Selma Enterprise and the Fresno Bee published articles about EPA's preliminary site investigation in early 1982 and the results of Selma Leasing Company's geotechnical study of the site in mid-1983. When Regional Water Quality Control Board (RWQCB) officials announced that the geotechnical study indicated that the plume of contamination was moving in a southwesterly direction, towards agricultural land and away from the City of Selma, general community interest in the groundwater contamination issue subsided.

Complaints about air and groundwater quality problems from at least three immediate neighbors of the site property began in 1981 and were directed to officials of the Fresno County Health Department (FCHD), RWQCB, and the

California Air Quality Management District. One resident indicated that he had complained to the Selma City Manager and had been referred to County Health officials, because the site is located outside Selma city limits. Another resident attended a Fresno County Resources and Development Department (FCRDD) hearing on a Conditional Use Permit for the site property in November 1983 and expressed concern that operating the wood treatment plant would result in additional soil and groundwater contamination. FCRDD officials responded that the permit required the operators to adhere to environmental controls that mitigated the threat of additional contamination.

An Uncontrolled Hazardous Waste Site Investigation was conducted by EPA DHS, and RWQCB in January 1981. In August of 1983, EPA ranked the site using the Hazardous Ranking System, (HRS) to determine whether to include the site on the Superfund-National Priorities List of hazardous waste sites. The HRS ranking for the site was 48.83, indicating that releases of hazardous substances from the site may present an endangerment to the human health and welfare or the environment. Based on this information, the site was listed as 195 on the Superfund National Priorites List in September 1983.

Considerable concern about area groundwater contamination was expressed by the General Manager of the California Water Company (CWC) to EPA at the time of EPA's preliminary site investigation. CWC, a private company supplying water to the City of Selma, has two relatively shallow wells located within one-half mile to the northwest of the site. When the geotechnical investigation revealed the extent of the contamination problem, CWC began to monitor its wells regularly for heavy metals and organic compounds. To date, however, no contamination of its wells from the SPT site has been detected. The General Manager received several calls prior to 1986 from residents in the vicinity of the site expressing concern about contamination of their private wells. The General Manager explained to residents that tests of CWC's water indicated that no contamination was present, and suggested they call the California Department of Health Services (DHS) or have their well water tested by a private laboratory if they were concerned about well water quality.

In July 1985, EPA held a community meeting to discuss EPA's plans to perform a Remedial Investigation (RI) and Feasibility Study (FS) at the site. Approximately 50 residents from Selma and other parts of Fresno County attended the meeting. Several newspaper and television reporters also attended. A number of the residents expressed concern at the meeting that no action was being taken at the site to correct contamination problems. Several individuals suggested that air emissions from the wood treating operations may pose a health hazard to plant workers and nearby residents. Others were concerned about local groundwater contamination beyond the SPT boundaries. EPA indicated that 25 wells within one mile of the site would be sampled during the RI as a part of the effort to determine the nature and extent of contamination.

B. Community Concerns From The June 22, 1988 Public Meeting

All of the community concerns related to groundwater contamination found at the SPT site are influenced by the area's dependence on groundwater resources, which are used for drinking and agricultural purposes. The major concerns, as expressed at the June 22, 1988 community meeting on the draft FS, were as follows.

Groundwater Contaminant Migration and Potential Well Impacts

Several meeting attendees raised questions during the June 22, 1988 community meeting about the groundwater contaminant plume migration. Questions were raised regarding rate of plume movement, depth of plume and whether additional monitoring of the lateral and vertical extent of contamination was planned. Other questions focused on relation of the plume to the city limits, whether any private wells were located within the plume and whether continuous monitoring of private wells would occur. Finally, a questioner asked about what the impacts would be to the water table if the deeper agricultural wells were contaminated.

47

C. Media Coverage Of Site Activities

Media coverage of SPT site activities has come primarily from two local newspapers, the Selma Enterprise and the Fresno Bee. Media coverage began in early 1982 when these two newspapers published articles about EPA's preliminary investigation. Media coverage followed with articles about the Selma Leasing Company's geotechnical investigation in mid-1983. The media attended EPA's July 1985 community meeting that explained EPA's upcoming RI/FS activities. EPA's initiation of RI field activities in April 1986 also gained media coverage. EPA's release of the FS for public review was also covered in news articles by the Fresno Bee and Selma Enterprise. Finally, media were present at EPA's recent June 22, 1988 community meeting held to elicit public comment on the FS and preferred remedial alternative.

D. Community Relations Activities Conducted By EPA

The following is a list of community relations activities conducted by EPA at the Selma Pressure Treating Company Superfund site:

March/April 1985	EPA community relations (CR) representatives conduct community assessment interviews with interested community members in the Selma area.
July 1985	EPA distributes a fact sheet announcing the commencement of RI/FS work, and describing the RI/FS activities to the community.
July 1985	EPA holds a community meeting in Selma to explain the RI/FS activities that EPA will be undertaking to respond to the community's questions and concerns.
January 1986	EPA finalizes the Community Relations Plan detailing the community concerns as expressed in the July 1985 community assessment interviews and the CR activities that EPA will conduct throughout the RI/FS process for the Selma site.
March 1986	EPA distributes a fact sheet describing the purpose and nature of the monitoring wells placed in the vicinity of the SPT site. EPA also distributes a Spanish translation of this fact sheet to aid in informing the Hispanic community of site activities.

May 1986	EPA Community Relations Coordinator meets informally with community members to listen to their concerns and to explain current site activities.
July 1987	EPA distributes well sampling results to interested community members.
April 1988	EPA distributes a fact sheet detailing the results of the RI. Also a newspaper ad was placed announcing public review period and meeting.
May 1988	EPA issued a one page notice announcing community meeting, public comment period and upcoming FS fact sheet and FS report.
June 1988	EPA distributes a fact sheet explaining the contents of the FS Report and announcing the upcoming public comment period and community meeting.
June 22, 1988	EPA holds a community meeting to explain the FS Report and to receive public comment on EPA's preferred alternative for addressing the soil and groundwater contamination at the SPT site.

II. OVERVIEW OF THE FEASIBILITY STUDY

The Feasibility Study for the SPT site, released by EPA in June 1988, evaluates various alternatives for cleaning up contamination at the site. EPA will use the FS and public comment received and summarized in this Responsiveness Summary to select the remedy for the site.

A. Description of the Contamination Problem

Soil and groundwater contamination at the Selma site resulted from spills, waste disposal, and waste discharges from wood treating operations. EPA performed soil and groundwater sampling at the site as part of its RI to determine the nature and extent of the contamination. Sampling revealed the contaminants associated with the site to include arsenic, chromium, copper, pentachlorophenol, and dioxin/furans. The RI also determined that a chromium plume extended to the south and southwest of the site, away from the City of Selma. Sampling did not indicate contamination of any domestic drinking water wells, irrigation wells, or municipal water supply wells.

Based on the RI data, EPA conducted an Endangerment Assessment (EA) to evaluate the level of public health and environmental risk posed by site contamination. The EA concluded that the primary contaminants of concern at the SPT site are arsenic and dioxin/furans in the soil and chromium in the groundwater. EPA used the EA results to establish site clean-up goals in the FS that provide adequate public health protection.

B. Summary of Remedial Alternatives

The FS for the SPT site evaluates potential remedial action technologies for addressing the soil and groundwater contamination. Section 121 of the Comprehensive Environmental Response, Compensation and Liability Act, as amended, 42 U.S.C. 9621 requires EPA to select a remedy that is, among other things, protective of human health and the environment, is cost-effective, attains federal and state requirements, and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical. Additionally, EPA is required to give preference to treatment remedies that permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants associated with the site.

The FS evaluated a wide range of clean-up alternatives and narrowed these to four potentially implementable alternatives to address the soil and groundwater contamination at the site. The four alternatives evaluated include no action, containment, treatment, and treatment with disposal.

- Alternative 1 - No Action: Under this alternative, EPA would take no additional remedial action at the site. EPA's objective in evaluating this alternative is to provide a baseline against which to compare other remedial alternatives under consideration.
- Alternative 2 - Containment: This alternative would use physical barriers to prevent further movement of the chromium plume and to prevent exposure to soil contaminants. A slurry wall that acts as an underground dam would be constructed to

prevent contaminated groundwater from migrating into unaffected portions of the aquifer. A cap designed according to the criteria of the Resource Conservation and Recovery Act (RCRA), would be constructed to cover the contaminated soil areas to prevent direct exposure to the contaminated soil and to prevent airborne particulate release.

- Alternative 3 - Treatment: This alternative would treat both the soil and groundwater. Groundwater would be pumped through lime (calcium carbonate) to remove the chromium. The treated water would be reinjected into the ground and the solid sludge containing the chromium would be disposed at an appropriate disposal facility. Soil would be excavated and treated with a fixative agent that immobilizes the contaminants in the soil. The treated soil would be replaced in the excavated areas, and covered with a RCRA cap.

- Alternative 4 - Treatment With Disposal: This alternative would use the same treatment method for contaminated groundwater as the previous alternative. Dioxin contaminated soil would be excavated and incinerated on-site. Incineration residue and untreated metals contaminated soil would be disposed of at a RCRA permitted disposal facility.

Based on an analysis of each alternative with respect to several evaluative criteria, such as protecting human health and the environment, reducing the toxicity, mobility and volume of contaminants, and cost, EPA has selected alternative 3, soil fixation with a RCRA cap and conventional groundwater treatment, as its preferred alternative. The cost of implementing this alternative is estimated at $11,280,000.

III. SUMMARY OF COMMENTS RECEIVED AND EPA RESPONSES

For purposes of simplification, EPA has categorized the comments, as well as responses to those comments, as follows:

1. Comments made by members of the interested public;
2. Comments made by State agencies; and
3. Comments made by potentially responsible parties (PRPs). Potentially responsible parties under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) include current and past facility owners or operators, persons who generated hazardous substances, and persons who transported, treated, or disposed of hazardous substances at site.

Each of these categories is presented, in turn, below.

III.1 COMMENTS MADE BY MEMBERS OF THE INTERESTED PUBLIC

No comments were received in writing from members of the public.

III.2 COMMENTS MADE BY STATE AGENCIES

EPA received comments from three state agencies. All of these comments are summarized below.

> Comments from a letter to EPA from the California Department of Health Services (DHS) dated July 6, 1988. Comments provided below, are derived from the memorandum attached to the letter which contained the DHS staff comments.

Comment 1: Additional soil sampling - The extent of soil contamination has not been fully characterized. Surface and subsurface soil sampling needs to be performed at several locations. The subsurface soil samples below the three to five foot depth should be selected based on grain size.

EPA Response:

EPA will be conducting additional characterization activities during the Remedial Design (RD) Phase. These activities will include the collection of additional surface and subsurface soil samples from the four source areas proposed to be remedied (i.e., waste sludge pit, unlined waste disposal pond, percolation ditch A, and the southeast disposal area) and along the percolation ditch B. Additional soil sampling activities will also be conducted in the retort area and along a drainage ditch located along the north side of Highway 99. The additional sampling activities will include collecting continuous subsurface soil samples down to the water table at selected locations. This approach will allow for a determination of the vertical extent of soil contamination.

The samples will be analyzed for site-specific contaminents. The analysis will also include both the total and soluble fraction for chromium, hexavalent chromium, copper, arsenic, and PCP. The analytical results will allow for the development of a relationship between the total and soluble fractions of the contaminants. This relationship will allow for the determination of which other areas of contamination may represent a potential problem from the standpoint of leaching contaminants into the groundwater. If other areas appear to represent a problem, then additional characterization activities will be performed in these areas or these areas will be included in the remediation plan for the site.

Comment 2: Subsurface characterization - The lateral extent and thickness of subsurface geologic strata needs to be more fully investigated and defined in areas impacted by groundwater contamination. This is particularly important for the clay that is described in the RI report as being locally continuous at a depth of approximately 50 feet below ground surface in the vicinity of the SPT site. The geologic characteristic should be accomplished by continuously cored boreholes at selected locations at a depth of at least 125 feet. Continuously cored boreholes should also be geophysically logged, which would require that the boreholes be installed using mud rotary drilling techniques.

EPA Response:

Six plume tracking wells to a depth of 110 to 120 feet below ground surface were drilled during the RI. The wells were drilled using a dual-tube percussion hammer rig, which provides excellent subsurface sample recovery. Continuous samples were collected in the field by an on-site geologist. In addition, four of the wells were geophysically logged using natural gamma. The lithologic information collected during the RI was adequate to characterize the subsurface geology in the area. As such, additional geologic investigations to depths of 125 feet will not be performed during the RD. EPA does recognize that additional subsurface data is required to more fully characterize the clay layer present at a depth of 55 to 60 feet. In order to obtain this information, lithologic data will be collected during the installation of the monitoring wells to be performed during the RD. The data will include the collection of continuous subsurface soil samples from the clay layer interval. As stated in the ROD, six intermediate monitoring wells will be installed to determine both the vertical extent of contamination and background conditions for the interval from 40 to 60 feet, which is expected to be directly above the clay unit. The well installation program will also include a determination of the lateral continuity and integrity of the clay unit. This will be accomplished by drilling to a maximum depth of 75 feet, in order to verify both the presence and thickness of the clay unit. The drilling technique to be utilized during this program will consist of dual-tube percussion hammer, or equivalent, such as air rotary with casing driver. Mud rotary drilling will not be used due to the disposal problems associated with the drilling mud. Geophysical logging of the boreholes will not be performed since detailed lithologic information will be obtained during the well installation program. Furthermore, the drilling methods include the use of temporary steel casing, which limits the use of geophysical logs.

Comment 3: Additional Monitoring Wells - The present network of monitoring wells needs to be expanded. Additional monitoring wells should be installed at a depth of approximately 50 feet BSG to further characterize the ground water plume. These wells should probably be screened at the top of the clay that is identified as being locally continuous in the RI report.

EPA Response:

Six additional intermediate monitoring wells designed to determine both the vertical extent of contamination and background conditions will be installed during the RD. These wells will be screened from 40 to 60 feet, which is anticipated to be the just above the clay unit.

Comment 4: Water Quality Monitoring - All monitoring wells need to be placed on a schedule for water quality monitoring. This schedule should be at least quarterly for a period of one year. Also the levels of chromium VI contamination need to be determined to design for site clean-up.

EPA Response:

The monitoring wells, including the newly installed wells, will be sampled quarterly for a period of one year during the RD. Hexavalent chromium data will also be collected during the RD.

Comment 5: Water Level Monitoring - All monitoring wells in the network should have their respective water levels measured monthly for at least a one year period. The water level data should be tabulated, interpreted, and plotted into flow nets (grid of equipotential and flow lines); individual flow nets should be constructed respective to well completion depths.

EPA Response:

Water level data for the monitoring well network will be collected on a monthly basis for a period of one year. The data will be retabulated and appropriate water level maps will be compiled.

Comment 6: Wells R-21 to R-25 - The RI report indicates the wells R-21 to R-25 are monitoring wells. However, the RI report does not provide construction criteria or completion depths for these wells. This information needs to be made available in order to better interpret ground water quality and equipotential data from these wells.

EPA Response:

EPA is currently trying to obtain additional information on these wells.

Comment 7: Dry Wells - The RI report indicates the existence of six dry wells in the near center of the SPT site. However, no description was provided for historical use of these dry wells. If possible, a description explaining when the dry wells were installed, the purpose for installation, time periods of use, and a listing of the substances, compounds, etc. and quantities that were placed in the wells should be provided. If information as to the types of substances that were placed into the dry wells cannot be determined, it may be necessary to initiate subsurface investigations in proximity to the respective wells to check for site-associated contaminants.

EPA Response:

It is EPA's understanding that the dry wells were installed to facilitate drainage in the percolation ditches located along the boundary of the storage yard. The date of the installation of the dry wells is not known at this time. In regard to a listing of substances, compounds, and quantity of contaminants placed in the wells, it is unlikely that this information is available since the objective of the dry wells was to facilitate stormwater percolation.

The dry wells in the north percolation ditch (Ditch A) will be properly abandoned as a part of the remediation of the ditch. Additional borings will be conducted in the south percolation ditch (Ditch B) during the RD. The objective of the borings is to evaluate the contamination associated with the ditch and the dry wells. The data collected during the boring program will be evaluated and a decision regarding the appropriate remedial measures to be taken will be made at that time. However, these activities are predicated to some extent, on EPA being able to locate the dry wells.

Comment 8: Extraction Wells - Twenty-five extraction wells are recommended for withdrawal of the contaminant plume at the SPT site. However, a technical analysis to document that proposed extraction wells provide an effective capture zone for the postulated contaminant plume is not provided in RI/FS documents. In addition, the extraction barrier is recommended without complete plume characterization. Present uncertainties as to the full extent of the plume may require a more expanded network of extraction wells and a subsequently larger ground water treatment facility.

EPA Response:

The extraction well field discussed in the FS was based on the data obtained from a preliminary two-dimensional groundwater model. The intent of the modeling effort was to design a conceptual extraction and reinjection system for the purposes of developing the costs for the conventional water treatment system. A detailed design of an extraction and reinjection system will be performed during the RD following the collection of the additional data. The data obtained from the design of the extraction and reinjection system will also be considered during the design of the water treatment facility.

Comment 9: Injection Wells - The FS document recommends "approximately" 35 four-inch diameter recharge wells to inject treated groundwater back into the aquifer. This recommendation is provided without a complete and thorough subsurface geologic characterization of the site. Injection of treated groundwater without detailed subsurface geologic characterization may severely exacerbate the clean-up effort by generating unforeseen changes in migration of the contaminant plume.

EPA Response:

As stated in the response to comment number 8 above, a detailed design of the extraction and reinjection system will be performed during the RD following the collection of the additional data.

Comment 10: RCRA Cap - The FS report describes several construction criteria for the RCRA caps recommended for areas of high surface contamination. A two percent (2%) minimum slope is recommended for the surface of the cap. Increasing the slope angle to five percent (5%) for tops of caps and soil liners is recommended. In addition, the permeability of cap liners should be checked in the "field" to verify that construction standards are achieved.

EPA Response:

The optimum slope of the cap and the appropriate quality control/quality assurance measures to be performed (e.g., field permeability tests) will be determined during the RD.

Comment 11: Clean-up Goals - The possibility of leaving contaminants in the soil which exceeds the Total Threshold Limit Concentration (TTLC) values exists. It is recommended that confirmation samples be analyzed for copper, arsenic, chromium and chromium VI to ensure the TTLC values are not exceeded. Waste extraction tests should be performed where applicable. These results should be compared to Soluble Threshold Limit Concentrations (STLC) values which are stated in the California Code of Regulations, Title 22.

EPA Response:

As stated in the response to comment number-1, the soil samples collected during the additional activities will be analyzed for both the total and soluble fraction for chromium, hexavalent chromium, copper, arsenic, and PCP. These same constituents and analyses will be performed during the confirmation sampling.

Comment 12: Costs - The alternative screening process used in preparation of the FS considers cost as a criteria to evaluate the various alternatives. This includes both capital and operation and maintenance costs. The capital costs include expenses associated with the purchase of land. In the implementability section of the FS report, the purchase of privately owned land to construct the slurry wall for Alternative 2, the extraction well field, and sludge evaporation lagoons for Alternatives 3 and 4 is discussed. However, the cost estimates in Appendix F do not include estimates for the purchase of land and vineyards.

EPA Response:

EPA felt that easements could be obtained from landowners. As such, the capital costs for purchasing the land were not included in the alternatives.

Comment 13: ARARS - DHS is withdrawing the Safe Drinking Water and Toxic Enforcement Act (Proposition 65) from consideration as an ARAR. This is based on an interpretation of the statue indicating that the intent of Proposition 65 was not to restrict environmental remediation activities.

EPA Response:

This comment is noted.

Comments from a letter to EPA from the California Regional Water Quality Control Board - Central Valley Region dated July 9, 1988.

Comment 1: The investigations which have been conducted at the site to date are not sufficient to adequately characterize the extent of ground water or soil contamination. The FS indicates that additional groundwater monitoring wells and soil borings are proposed during the RD phase of the investigation. The extent of contamination at the site should have been determined prior to proposing the remediation alternative. The results of the additional investigations may have a bearing on the remedial action alternative chosen.

EPA Response:

EPA felt that there was sufficient information to develop, screen, and select appropriate remedial alternatives. However, EPA does recognize that additional investigation activities are required to define the extent of the contamination. These activities have been described in the response to comment numbers 1, 2, and 3 of the DOHS letter. Depending on the analytical results for the soluble fraction of the contaminants, to be collected during these initial activities, additional characterization activities may be conducted in other areas or these areas may be included in the remediation plan for the site.

Comment 2: The clean-up goals developed for this site are based on human health risk, risk associated with dermal contact and incidental ingestion of the contaminated soils by workers, trespassers and residents. These clean-up goals do not provide for the protection of groundwater quality. As such, these clean-up goals are not acceptable. More appropriate clean up levels for the constituents of concern are listed in the Table above. An attenuation factor of 10 or less may be appropriate for the site specific conditions (shallow groundwater, sandy soils, etc.) at this site. The clean-up goal for groundwater (chromium) clean-up is acceptable.

EPA Response:

EPA recognizes that the soil clean-up levels for total chromium and total arsenic may not result in groundwater protection if the soluble fraction for these metals is high. However, data on the soluble fraction of these metals has not been collected to date. Data sufficient to determine the soluble fraction for chromium, hexavalent chromium, copper, arsenic, and pentachlorophenol will be collected during the additional characterization activities to be conducted during the RD. Following the analysis of the additional data, the clean-up goals for these parameters will be re-evaluated to assure that the groundwater resource will be protected and the appropriate MCLs are obtained.

Comment 3: CDM has made assumptions as to the volume of soil and groundwater contaminated at the site without substantiating data to support their assumptions. Before the volume of soil and ground water can be determined, the areal and vertical extent of soil and ground water contamination will have to be defined.

EPA Response:

The data for determining the volume estimation consisted of both the extensive surface soil sampling results and the general trend in the vertical extent of contamination observed at various borings conducted at the site. This data provided the basis for the assumptions used to estimate the volume of soil to be remediated. However, EPA does recognize that additional data is required to fully define the extent of soil contamination. This additional data will be collected during the characterization activities to be conducted during the RD. These activities are described in the response to comment numbers 1, 2, and 3 of the DOHS letter.

Comment 4: Section 1.3.3, page 1-29. Surface samples were collected and analyzed for benzene, toluene, and xylene (BTX), as well as the polycyclic aromatic hydrocarbons (PAH), such as naphthalene and pyrene. These constituents should also be analyzed for in subsurface soil samples, especially in those areas where operational spillage of the PCP solvent (diesel fuel) occurred. BTX constituents are volatile and would not necessarily show up in surface samples, but may be present in the subsurface.

EPA Response:

Selected subsurface soil samples collected during the additional characterization activities to be conducted during the RD will be analyzed for BTX and PAHs.

Comment 5: Section 1.3.4, Figures 18 and 19. Much of the data presented in these Figures are in terms of "J" (data estimated) and "R" (data rejected). This type of data is of little use. Additional samples should have been collected and analyzed prior to submittal of the RI. A routine sampling program of the monitoring wells should have been implemented to aid in determining whether or not any trends or patterns of contaminant migration was evident.

EPA Response:

The data qualified by a J (Data Estimated) is consistently used by EPA to define trends in contamination. As such, this data is extremely useful, contrary to the statement in the comment. In regard to a routine sampling program for the monitoring wells, EPA will conduct a quarterly water quality sampling and monthly water level measurement program for a period of one year during the RD.

Comment 6: Section 1.3.4, page 1-42, and Section 2.3.2, page 2-10. Since PCP and dioxins have been detected in previous sampling rounds in wells R23 and R24, additional PCP, dioxin/furan analysis should be performed during the RD phase in conjunction with the chromium analyses already planned.

EPA Response:

These parameters will be included in the quarterly sampling program for the monitoring wells.

Comment 7: Section 1.3.5, Table 1-3. Seven areas of concern have been identified due to elevated levels of site specific contaminants. A total of five soil borings were drilled in the two unlined percolation ditches (A&B). Additional investigations are necessary in these areas to determine the location of the dry wells and to eliminate them as a conduit for contaminant migration. Contamination around these dry wells is likely since these wells were used for disposal of contaminated storm water runoff in the past.

Three of the seven areas of concern had only surface samples collected. The assumption was made that the vertical contamination for these areas would have a similar pattern to those that had soil borings drilled to ground water. They assumed contamination was present down to groundwater for these locations. This assumption is not appropriate. Borings should have been drilled at these sites for subsurface soil characterization as well as determination of contaminant concentrations. Two of the seven areas of concern had one soil boring drilled. This is not sufficient to characterize the lateral extent of contaminant concentrations. Additional borings are necessary.

EPA Response:

The dry wells will be investigated during the RD. In addition, soil borings to further define the extent of contamination will be conducted in the areas proposed to be remediated. Both of the items are discussed in more depth in the response to comment numbers 1 and 7 of the DOHS letter.

Comment 8: Section 2.4.4.1, Table 2-2. The 16,000 yd^3 of soil to be excavated was based on the human risk clean-up goals developed. These are not sufficient to provide for the protection of the beneficial uses of areal groundwater. It is likely that substantially more soil would require remediation to meet our concerns. All seven areas may require remediation along with some other areas of concern that have been proposed for investigation during the RD phase.

The fourth location identified in Table 2-2 should be the "Southeast Disposal Area" instead of the indicated "Southwest Disposal Area."

EPA Response:

As described in the response to comment number 2 above, and comment number 1 of the DOHS letter, additional solubility data will be collected during the RD. This data will be analyzed and the clean-up goals re-evaluated as appropriate. This re-evaluation could include additional characterization activities in other areas presently not included in the initial phase of investigations to be conducted during the RD. The comment concerning Table 2-2 is correct and noted.

Comment 9: Section 2.4.4.2, page 2-17. As adequate long-term pump tests were not performed during the RI, long-term operation of the groundwater extraction system cannot be adequately determined from data presented. Once the extent of the plume had been defined by the installation and analysis of additional monitoring wells (six wells are currently proposed), long-term pump studies should be conducted. This information is required to adequately design the extraction and reinjection systems. It will have to be demonstrated that the reinjection system designed will aid the extraction system rather than work against it by changing the migration route of the contaminant plume.

The hydrogeologic cross-sections presented on Plates 1 and 2 for P-1D, P-2D, P-3D, P-4D, and P-5D are not sufficient to demonstrate a continuous clay strata 5 to 10 feet thick and at a depth of 55 feet. It is assumed that this strata has impeded the downward migration of contamination. The additional plume tracking wells proposed during the RD phase should not be limited to this depth when investigating the plumes vertical migration.

EPA Response:

As described in the response to comment number 8 of the DOHS letter, a detailed design of the extraction and reinjection system will be performed during the RD following an evaluation of the data collected during the additional investigation activities. These activities will also include conducting long-term constant discharge aquifier tests.

In regard to the second portion of this comment, EPA proposes to use a phased approach to the investigation on the vertical extent of groundwater contamination. This initial phase will include an investigation of the integrity of the clay unit and a determination of the degree of contamination present directly above this unit.

Additional details regarding this investigation are presented in the response to comment number 2 of the DOHS letter. If it is determined that the interval directly above the clay unit has significant contamination, an additional phase will be conducted to determine the extent of contamination below the clay unit.

Comment 10: Section 4.2.2, page 4-6. Field permeability test must be conducted on the clay liners to verify that the construction standards for the caps are achieved.

EPA Response:

See the response to comment number 10 for the DOHS letter.

Comment 11: Section 4.2.2, page 4-10. Since the chromium plume has not been adequately defined and due to a lack of sufficient aquifer characterization (see Comment 9), it may be premature to propose a water treatment system designed with a treatment flow rate of 1,040 gpm and give a remediation period of five years.

The reinjection of treated groundwater, as well as the sludge lagoons and temporary waste piles, will be regulated by waste discharge requirements (WDRs) in order to provide for the protection of the beneficial uses of the underlying groundwater.

EPA Response:

As discussed in the response to comment numbers 8 and 9 of the DHS letter, the treatment flow rate was based on a preliminary two-dimensional groundwater model. The purpose of the modeling effort was to design a conceptual extraction and reinjection system for the purposes of the FS. A detailed design of an appropriate well field and treatment system will be performed during the RD following the collection of the additional data.

The substantive requirements of the WDR will be met for the reinjection of the treated groundwater, as well as the design of the waste lagoons and temporary waste piles.

Comment 12: Section 4.2.2, page 4-11. The surface impoundments to be utilized for sludge drying will need to meet the construction criteria in Title 23. Subchapter 15 of the California Code of Regulations (CCR). The surface impoundments cannot be classified without a characterization of the sludge. Characterization of the sludge is also required before choosing a final disposal option. A clay liner should be considered in the design of the lagoons. There are no discussions concerning the removal of sludge and what precautions will be taken to prevent the sludge removal equipment from damaging the liners. This needs to be addressed.

EPA Response:

The design of the surface impoundments will meet the substantive requirements of the CCR. In addition, the sludge will be characterized prior to selection of the proper disposal option. The use of the clay liner, as well as the procedure to remove the sludge, will be addressed during the RD. The second portion of this comment regarding the additional excavation is addressed in the response to comment number 2 above.

Comment 13: Section 4.2.2, page 4-12. Construction of the temporary waste and storage facilities in the staging area will need to comply with the construction standards for Class I waste piles in Title 23, Subchapter 15, CCR.

The contaminated areas are to be excavated down to groundwater. Prior to backfilling these excavated areas with the mixed soil and fixating agents, precautions should be taken to guarantee that the fixed soil will be backfilled in such a condition and manner that will prevent leaching of contaminants to the groundwater. A containment system should be considered for installation into the excavated areas to segregate the backfilled contaminated mixture from the ground water.

EPA Response:

The substantive requirements of the CCR for the construction of the temporary waste and storage facilities will be met. The design details for backfilling the fixed soil in a manner which protects the groundwater quality will be performed during the RD.

66

Comments from a letter to EPA from California State Clearing House
Office of Planning and Research
Dated July 8, 1988

Comment 1: An encroachment permit from the Department of Transportation will be required for any work performed within the State right-of-way. Any proposed mitigative measures within the right-of-way should be coordinated with CalTrans, and the Department will be informed of proposed disposal sites.

EPA Response:

EPA will obtain an encroachment permit from CalTrans. In addition, EPA will coordinate any mitigative measures with CalTrans and inform CalTrans of the proposed disposal sites.

III.3 COMMENTS MADE BY POTENTIALLY RESPONSIBLE PARTIES

EPA received written comments from three potentially responsible parties. All of these comments are summarized below.

Comments from Letter to EPA from Bergman and Wedner, Inc., Dated June 30, 1988

Comment 1: A major conclusion of the RI report is the chromium has contaminated the soil at several locations to depths within 5 feet of surface, as well as shallow groundwater. Yet, most of the chromium analyses appear to have been invalidated during the quality control process. (See, for example, p. 4-36, RI report.) How then can this conclusion be drawn from unverified data?

EPA Response:

Some of the data in question was qualified during data validation as "usable for limited purposes" indicating that the data did not meet all of the quality control/quality assurance (QA/QC) criteria under the EPA

Contract Laboratory Program (CLP). However, the data was of sufficient quality to utilize in defining the contamination trends. Therefore, these data were utilized in estimating the extent of contamination at the site.

Comment 2: Chromium contamination of soil and water is analyzed in terms of total chromium. Previous work has indicated the presence of at least two chromium species, trivalent and hexavalent. Hexavalent chromium is a known carcinogen, while trivalent chromium is considerably less hazardous in the environment. Why weren't these two species of chromium quantified individually in the RI study, and why is all the chromium in the FS report considered to be hexavalent, when certainly it is not?

EPA Response:

Hexavalent chromium contamination was analyzed in both groundwater and soil samples collected during the RI. However, a majority of the data was rejected during the data validation process due to sample holding time problems. In addition, groundwater samples were analyzed for hexavalent chromium using field instruments. Hexavalent chromium was detected using the field instruments, although this procedure is considered to be a method. Due to the data validation problems associated with the hexavalent chromium data, additional data will be collected during the Remedial Design (RD) phase.

Any reference in the FS to the effect that all of the chromium is in the hexavalent form was unintentional. The semi-quantitative data collected during the RI indicates that hexavalent chromium is present but does not constitute all of the chromium detected. Due to the presence of the hexavalent chromium, the process options and treatment technologies presented in the FS need to consider this constituent, as well as trivalent chromium. As such, both hexavalent and trivalent chromium are discussed in the FS.

Comment 3: Additional groundwater background data needs to be collected. This data collection activity should include the installation of two additional shallow upgradient wells.

EPA Response:

The present upgradient wells include R-21, P-1S, and P-1D. Monitoring wells R-21 and P-1S are completed in the shallow portions of the aquifer. Well P-1D is completed at a depth comparable to the 5 deep monitoring wells located downgradient of the site. The deep monitoring wells are also completed at a depth similar to the domestic wells in the area.

The present locations of wells R-21, P-1S, and P-1D are directly upgradient of the site. As such, these well locations provide sufficient data on background water quality. Therefore, additional upgradient shallow or deep monitoring wells will not be installed.

Comment 4: The FS and RI reports do not discuss the potential contributions from other industrial activities in the area to the groundwater and soil contamination.

EPA Response:

EPA performed preliminary assessments (PA) on several sites in the vicinity of the SPT site. The objective of the PAs was to determine whether the waste disposal practices at the site under investigation could result in potential releases of contamination to the environment. The sites selected for PAs were the Selma Nursery, Golden State Auto Body, Upright Harvestor, Pacific Gas & Electric's former Selma Gas Plant, Selma Turkey, West Coast Growers & Packers Inc., Selma Ag Supply Inc., and Selma Electroplating. With the exception of Selma Ag Supply and Selma Electroplating, EPA recommended that no further action be taken at the other sites. EPA has performed site Investigations (SI) at both the Selma Ag Supply and Selma Electroplating. The results of the SIs for each site are summarized below.

The Selma Ag Supply site is an active agricultural chemical retail outlet for the Selma area. The chemicals sold at the site include bulk solid and liquid insecticides, herbicides, fungicides, and fertilizers. No blending or formulating of chemicals takes place on site. Selma Ag Supply is located approxiamtely 300 feet to the northwest of the SPT site.

As a part of the SI for Selma Ag Supply, several surface soil samples were collected. The samples demonstrated that surface soils are contaminated with metals and pesticides. Elevated chromium values, up to 90 mg/kg, were detected in the samples. However, the source of the chromium contamination in the soil is not known. The SI recommends that additional investigations are conducted at the Selma Ag Supply site to determine the lateral and vertical extent of soil contamination and obtain data on nearby groundwater quality.

Selma Electroplating is located approximately 1.5 miles to the northwest of the SPT site. Chrome, copper, nickel, brass, gold, and silver plating operations have taken place on site on an intermittent basis. In the past, untreated wastewater and runoff form washing the floor has been drained onto the facility soils.

Several soil samples from depths ranging from 0 to 3 feet were collected as a part of the SI. The area selected for the collection of samples, consisted of the waste discharge points around the facility. The samples were analyzed for the full suite of metals. The results showed elevated levels of several metals, inlcuding arsenic, chromium, and copper. The levels of chromium contamination ranged from 21 to 765 mg/kg. The SI recommends that the groundwater be investigated to determine whether contamination from the site is present.

Comment 5: Additional wells are required to further delineate the western extent of the groundwater contamination plume.

EPA Response:

EPA recognizes that additional monitoring wells are required to further delineate the southwestern plume boundary. To address this additional data requirement, EPA has proposed the installation of two shallow monitoring wells in the area to the west and south of well R-24 (FS Report, pg. 1-36).

Comment 6: There appears to be an error in either FS Figure 1-13 or FS Figure 1-14 (see also RI Figures 3-3 and 3-4). These figures depict elevations of shallow and deep groundwater levels, which should differ by some 100 feet or more, but which are shown as nearly identical.

EPA Response:

There is not an error in the referenced figures. There may be some degree of interconnection between the shallow and deep zones which are being monitored by the wells at the site, which would result in similar levels.

Comment 7: Chromium, nickel, arsenic and copper were all used in the wood preservative compounds at the site, yet the FS and RI reports appear to conclude that chromium is the only element transported downward to contaminate the groundwater. The reports do not appear to discuss chemistry, chemical compounds, or solubility data on these elements to buttress this apparent conclusion.

EPA Response:

The referenced reports conclude that chromium is the only metal-related, site-specific compound to be transported downward to the groundwater table because chromium was the only compound observed in the groundwater at elevated levels above background. The other metals have not been detected at levels significantly above background.

Comment 8: Metal ratioing is a standard and acceptable method of evaluating chemical data, metal source regions, and transport phenomena. This method was apparently not used to any useful extent in the RI or FS studies. Metal ratioing would be a useful tool in detecting possible contributions by off-site sources of chromium, arsenic, copper, and other metals to the groundwater underlying the site.

EPA Response:

Metal ratioing was not used at the site because of the high degree of variability in the geochemical characteristics between the metals. For example, the solubility of the metals in both the soil and groundwater can vary dramatically; resulting in significant variations in the mobilities of the different metals. In fact, the mobilities of the different metals can vary so much that the ratio of the metals in the groundwater will not be constant across the plume. As such, metals ratioing is not a very effective means of determining source areas.

Comment 9: The FS and RI reports appear to be silent as to the rate of groundwater flow in the area of the site.

EPA Response:

Based on the data presented in the RI report, the effective groundwater flow velocity varies from 100 to 830 feet/year, with an approximate average velocity of 250 feet/year.

Comment 10: Much of the analytical data appear to be inconsistent. In shallow groundwater analyses, arsenic is undetected in samples adjacent to the site (Wells R-21, R-22, and R-23), yet it is detected in wells up to 2,400 feet from the site (Wells R-24, P-6S, and P-3S). If the metals have a common source, as the report claims, this fact should be reflected in metal ratios, which should be consistent from sample to sample, particularly in water analyses. This does not appear to be the case for the values of chromium, copper, and arsenic detected in FS Figures 1-18, 19, and 21 (attached).

EPA Response:

Low background levels of arsenic appear to occur in the groundwater system at the site. This is consistent with the fact that arsenic in the amount of 3.6 μg/L was detected at upgradient monitoring well P-1S during the

February 1987 sampling effort. Therefore, the low levels detected at wells R-24, P-6S, and P-3S appear to be consistent with background concentrations of arsenic in the area.

Comments from Letter to EPA from Gerald Petery dated June 30, 1988.

For convenience, the source of the comment in the letter is referenced under each of the comments below.

Comment 1: The RI scope of work was too broad and what is needed is closely spaced sampling to define the extent of soil and groundwater contamination in the identified source areas (Page 4, 3rd para.).

EPA Response:

As described in the Draft FS and ROD, additional monitoring well installation and groundwater sampling activities will be conducted during the Remedial Design (RD) phase. The intent of these activities is to further define the lateral and vertical extent of groundwater contamination. This information will further define the groundwater contamination plume and assist in the design of the remediation program for the site.

Additional soil sample collection activities will also be conducted during the RD, as proposed in the Draft FS. These activities include the collection of additional samples in the source areas recently identified to the EPA. These areas include both the retort area and the drainage ditch along the Highway 99 right-of-way. Additional soil borings will also be conducted in the source areas identified during the RI (e.g., waste disposal pond, southeast disposal area, etc.). The intent of the boring program will be to further define the vertical extent of site-related contamination.

Comment 2: The approach of CDM does not provide the detailed definition of the extent of soil and groundwater contamination, which are needed to design a cost-effective remediation program (Page 4, 4th para.).

EPA Response:

As discussed in the response to the previous comment, several sampling activities to further define the extent of groundwater and soil contamination will be conducted during the RD phase.

The volume estimates for the soil, which were utilized to generate the costs for the remedial alternatives, were based on extensive surface soil sampling and the general trend of contamination observed at the various borings conducted at the site during the RI. The volume of groundwater contamination was based on the general trend of the plume, which was derived from the data collected during the RI. EPA felt that there was sufficient data to estimate the volume of contaminated soil and groundwater for the purposes of defining appropriate remedial alternatives to be conducted at the site. However, the additional data to be collected during the RD will be utilized to refine the development of the proposed remedial plan for the site.

Comment 3: The lateral extent of the site-specific chemicals in the surface soils was not defined sufficiently to form a basis of a FS of soil remedial options (Page 5, 1st and 2nd paras.).

EPA Response:

Extensive sampling of surface soils was conducted during the RI. These results provided data on both the levels of contamination and general trends in the extent of contamination, particularly in the suspected source areas. Although the lateral extent of contamination is not thoroughly defined, EPA felt that there was sufficient data to proceed with the remedial alternative analysis in the FS, particularly since the sampling activities defined both the levels of contamination and general trend of contamination. Additional data on the lateral extent of contamination in the source areas will be collected during the RD phase.

Comment 4: The volume of chemically-affected soil cannot be estimated based on the results of the RI report, and this estimate is necessary to assess the feasibility of alternative remedial actions (Pg. 5, 3rd para.).

EPA Response:

As discussed in the response to comment number 2, the volume estimation was based on both the extensive surface soil sampling data and the general trend in vertical extent of contamination observed at other soil borings conducted at the site. EPA felt that this approach was sufficient to define the volume of contaminated soil for the purposes of developing remedial alternatives in the FS. As mentioned in several locations above, additional sampling will be performed during the RD. The intent of this sampling is to further define the vertical and lateral extent of contamination.

Comment 5: The vertical distribution of the chemical concentrations in source areas is undefined because subsurface samples were not taken beneath the source areas. We contend that these areas could have and should have been drilled and sampled (Page 6, 2nd para.).

EPA Response:

See response under comment numbers 2 and 4 above.

Comment 6: All hexavalent chromium analyses for subsurface soil samples were rejected during data validation. Accordingly, the current evaluation concerning chromium and the appropriateness of its proposed clean-up are substantially lacking in foundation (Page 6, 4th para.).

EPA Response:

The clean-up level derived for chromium was based on total chromium, not hexavalent chromium. Furthermore, a large majority of the total chromium data was considered usable following the data validation process. However, EPA recognizes the data validation problems associated with the hexavalent chromium database and will perform additional sampling for hexavalent chromium analysis during the RD phase.

Comment 7: The existing Brown and Caldwell wells could have added significant information to the definition of the groundwater contamination plume (Page 7, 3rd para.).

EPA Response:

EPA recognizes that the wells could have added significant information on the groundwater plume. However, the wells could not be located in the field and, as such, the status of the wells was unknown. Therefore, the wells were not incorporated into the RI.

It has recently been pointed out to EPA that the wells may still be present and suitable for sample collection. If this is the case, these wells will be considered for inclusion in the sampling activities to be conducted during the RD phase.

Comment 8: There apparently is no documentation for the EPA "R" series monitoring wells . . . It is unusual that there is no documentation for these wells, and its absence detracts from the reliability of the samples obtained from these wells (Page 7, 5th para.).

EPA Response:

The depth of these wells is known from measurements performed in the field. The wells are shallow completions and are presumably screened at the water table. In addition, the wells were installed by an EPA Emergency Response Team (ERT) contractor following EPA approved protocol. Therefore, the wells should provide reliable groundwater information. However, EPA is trying to obtain additional documentation on these wells.

Comment 9: The status of the existing Brown and Caldwell monitoring wells should have been determined and, if not usable, properly abandoned. (Page 7, last para.; Page 8, Paras. 1 and 2).

EPA Response:

EPA is presently attempting to determine the status of the Brown and Caldwell wells. If the wells are usable, appropriate wells will be included in an on-going sampling program to be performed during the RD. If the wells are not usable, appropriate measures will be taken to minimize aggravation of the existing problem.

Comment 10: Analysis reported by Brown and Caldwell suggest that there is a possibility of two overlapping plumes originating from separate sources near wells R-23 and R-24. Additional wells should have been installed between these wells to test the hypothesis of multiple source areas. The monitoring well locations sampled by CDM do not allow the lateral extent of the plume to be well defined (Page 8, 3rd para.).

EPA Response:

EPA recognizes that there are different sources contributing to the groundwater contamination at the site and that there is a potential of multiple plumes. In order to assess this potential, EPA will attempt to sample the existing Brown and Caldwell wells W-7 and W-8, which are located in intermittent positions between wells R-23 and R-24. The inclusion of these wells into the sampling program will be dependent upon the status of the wells, as discussed in the response to comment number 9.

Comment 11: The distribution and speciation of chromium within the plume area is unknown. This information should be determined prior to formulating a clean-up plan (Page 8, last para.).

EPA Response:

Semi-quantitative data on the speciation and distribution of chromium was collected during the RI. This data indicated the presence of both trivalent and hexavalent chromium. This information was incorporated into the FS and the treatment of both chromium species was considered during the development of the remedial alternatives. Therefore, for the purposes of the FS, there was sufficient chromium data to develop the remedial alternatives. However, EPA will collect data on the speciation and distribution of the chromium within the groundwater plume during the RD sampling program. This information will be incorporated into the RD for the conventional groundwater treatment system.

Comment 12: A potential source of groundwater contamination is the drainage discharge area located near the intersection of Dockery Avenue and Highway 99. No monitoring wells have been installed to test the hypothesis of a plume of chemical concentrations in the groundwater in this area (Page 9, 1st para.).

EPA Response:

A shallow monitoring well will be installed downgradient of this potential source area.

Comment 13: Other potential sources of groundwater contamination, including the Consolidated Irrigation Ditch, may exist in the area (Page 9, 2nd, 3rd paras.).

EPA Response:

See response to comment number 4 under the letter from Bergman and Wedner, Inc.

Comment 14: The percent of hexavalent chromium to total chromium for wells R-23 and R-24 was not expressed — a determinative of great importance (Page 9, last para.).

EPA Response:

This information was not reported due to the semi-quantitative nature of the hexavalent chromium data. This information will be reported for future sampling activities.

Comment 15: Screen testing for PCP was conducted using EPA Method 625, which is very expensive. A less costly approach should have been used (EPA Method 420.1). (Page 10, 1st para.).

EPA Response:

It is not clear which screen testing the comment is referencing. However, Method 625 is the standard gas chromatograph/mass spectrometry (GC/MS) method used under Routine Analytical Services for the Contract Laboratory Program (CLP). The advantage of using method 625 is that there are a number of parameters which are included in the analysis. As such, the method can be a cost-effective analysis when there are a number of parameters of interest.

Comment 16: Slug tests are not appropriate method for testing the transmissivity of highly permeable aquifers. Even short term constant-discharge tests would allow a more meaningful calculation of aquifer transmissivity. There is no quantitative on-site information about hydraulic properties of the saturated sediments underlying the SPT site (Section II.B.4, pgs. 10 and 11).

EPA Response:

The advantages and disadvantages of the slug test method have been well documented in the literature. Despite the limitations discussed in the comment, the method is a widely accepted and useful technique for estimating aquifer transmissivity. Results can be obtained easily and inexpensively, and a large number of wells can be tested in a short period of time. There is no risk of artificially inducing contaminant flow within the aquifer, and no discharge of contaminated water. In addition, the areal variability in hydrologic characteristics of the aquifer can be evaluated; this is not possible with one or two single well pump tests.

Both slug in and slug out tests were performed at each well at the site and the results for both tests were presented in the RI report. In some cases, a better solution was obtained for either the slug in or slug out portion of the test. This results primarily from the experience of the operator and is one of the advantages of the method, since data can be reviewed in the field and additional tests performed immediately as is necessary. For example, the comment states that the initial change in water level was too small (0.09 feet) to calculate the aquifer permeability in well P-2D. However, if the slug out data had been examined it would be apparent that an initial change in head of 0.9 feet was observed during this test and that a good curve fit was obtained. In addition, it should be noted that the instrumentation used collects the first ten readings at an interval of 0.2 seconds, not one second.

The slug test data for the deep wells are in good agreement. There is less than one order of magnitude difference among the six wells that were tested. This variation is within the expected accuracy of the method.

The comment indicates that the results of the slug test are nearly useless because they do not show a difference in the hydraulic conductivity between the shallow and deep aquifers. Since both aquifers are composed of similar materials, a large difference would not be expected.

EPA does plan to conduct a long-term constant discharge aquifer test during the RD. This test will be performed utilizing an observation well installed adjacent to a selected upgradient well at the site.

Comment 17: The precise volume of affected soils is not known, since there are not enough soil borings near hot-spot source areas. As such, it is difficult to predict the final cost of the various soil remedial actions, and the validity of the FS is substantially diminished by the assertions of conclusions without supporting data.

EPA Response:

The approach utilized to estimate the volume of contaminated soil and the additional activities to be conducted to further characterize the source areas are discussed in the responses to comments 1, 2 and 4 above. The final cost of the soil fixation will be determined following the collection of the additional data.

Comment 18: Because of the inadequate initial evaluation of hot spots, it may be that the actual cost of conducting the soil remedial actions may be much higher than estimated and that other options become more favorable in light of such costs. It is possible that less than the estimated 16,000 cubic yards were affected, resulting in lower remedial costs for this and other technologies (Page 12, 1st para.).

EPA Response:

As mentioned in the response to comments 1, 2 and 4 above, additional characterization activities will be conducted during the RD phase. Depending on the results of the investigations, the remedial costs will be adjusted accordingly. If other options for remediating the site are more favorable, then the Record of Decision (ROD) will be amended and the appropriate option selected.

Comment 19: CDM states that soil removal actions would remove elevated concentrations of chromium, copper, and pentachlorophenol, even though these chemicals are not present in soils at concentrations that would cause significant health concerns. As such, it is difficult to estimate how much soil is being removed to remedy arsenic and dioxin problems and how much soil is being removed for other chemicals (Page 9, 2nd para.).

EPA Response:

The volumes of soils to be remediated were based on both dioxin and arsenic contamination (see Table 2-2, FS Report). However, other chemicals are associated with the dioxin and arsenic contamination due to the similar disposal practices used for all of the chemicals at the site. Since the site-related chemicals are associated with each other, any remediation of a particular source area would effect all of the chemicals present.

81

Comment 20: CDM did not perform any FS work to determine whether such soil treatment would actually decrease the mobility of all constituents in the soil matrix. Specifically, it is our concern that raising the pH may increase the solubility of pentachlorophenol, chromium, and arsenic (Page 12, 3rd para.).

EPA Response:

EPA will perform a soil fixation treatability study during the RD which will address this concern.

Comment 21: Arsenic is relatively immobile and currently does not appear to pose a threat to groundwater. Hence, arsenic remediation may be restricted to reduction of human-contact with arsenic containing soil (Page 12, 4th para.).

EPA Response:

Chromium is fairly mobile and will continue to degrade the groundwater resource in the area. In that chromium is associated with the arsenic, the fixation will also reduce the mobility of both chromium and arsenic. This will prevent the leaching of chromium out of the soil and into the groundwater. Therefore, fixation and capping of the contaminated areas will both reduce the mobility and the potential for human contact.

Comment 22: The vertical distribution of chromium in the source areas is still undefined. Although chromium levels in the soil are below health-based clean-up concentrations, residual chromium in the soil may leach downward to recharge the chromium in groundwater (page 12, last para.).

EPA Response:

The vertical distribution of chromium will be defined during the RD (see response to comments 1, 2 and 4). In addition, soluble levels of chromium in the soil will be determined through sampling during the RD. If it is

DRAF

RA_Letters/Memo/325

MEMORANDUM

TO: Kevin Kelly (San Francisco)

FROM: Gordon McCurry (Denver)

DATE: April 5, 1988

PROJECT: EPA Contract No.: 68-01-6939

DOCUMENT NO.: 123-FS1-IO-FZQX

SUBJECT: Preliminary Analyses of No Action and Ground Water Extraction Alternatives at the Selma RI/FS Site

INTRODUCTION

A preliminary analysis was undertaken for two of the alternatives to be evaluated in the Selma, California RI/FS site Feasibility Study. The first alternative that was modeled, the No Action Alternative, involved estimating the time required for chromium to migrate in ground water under natural flow conditions to off-site wells. A second alternative involved modeling a ground water extraction system that would remove contaminated ground water under two and five year time scenarios.

The following discussion presents the background, assumptions, methodology, and results for both the no action and ground water extraction alternatives. The results derived from these preliminary analyses should be considered as estimates only. Additional on-site hydrogeologic and geochemical data combined with more sophisticated modeling techniques would be required to refine the results obtained in the present analyses. The calculation brief for the analyses presented in this memo is document No. 123-FS1-IO-GAEH.

ASSUMPTIONS USED IN THE ANALYSES

(A) HYDROGEOLOGIC ASSUMPTIONS

1. Aquifer is unconfined, homogeneous, isotropic, and infinite in areal extent.
2. The base of the aquifer (clay at approximately 50 feet below surface) is impermeable.
3. Aquifer saturated thickness = 25 feet; (derived from RI Table 2-8 and Plates 4 and 5, discounting clay intervals; CDM, 1988).

PROJ: 7777-123 FILE: IO DEN 634

DOC NO: 123-FS1-IO-FZQX
DOC:DATE: 04/05/88 ENTRY DATE: 07/12/8
DESC-MEMO: PRELIMINARY ANALYSIS OF GROUNDWATER EXTRACTION ALTERNATIVES.

4. Local hydraulic gradient = 0.0011 to 0.0017 ft/ft = I; (Page 3-8 and Figures 3-3 to 3-7 of RI). Average gradient assumed to be 0.0014 ft/ft.

5. Specific yield = effective porosity = 0.30 = n; (average value for fine sane; McWhorter and Sunada, 1977, p. 31).

6. Total porosity = 0.40 (derived from page 3-6 of RI).

7. Aquifer media dry weight soil bulk density = 1.6 gram/cm^3 = ρ; (average value for fine sand; Walton, 1984).

8. Hydraulic conductivity = 100 to 400 ft/day = K; (representative range from slug tests conducted in vicinity of plume, 3/88, and from Freeze and Cherry, 1979). Average assumed to be 150 ft/day.

9. Effective ground water flow velocity = 100 to 830 feet/year = v = (K/n)(I). Average flow velocity assumed to be 250 ft/yr.

10. Dispersion coefficient = 10,000 to 83,000 ft^2/yr = D = (α)(v) + D*.

    α = dispersivity = 100 ft; (based on 2,000 ft distance; Walton, 1984, page 37).

    v = flow velocity = 100 to 830 ft/yr.

    D* = molecular diffusion (assumed negligible).

(B) GEOCHEMICAL ASSUMPTIONS

1. Chromium, the contaminant of concern, is in the hexavalent (CrVI) state; (based on April 1986 sampling results for wells R-23, R-24, and R-25 presented in Appendix D of RI report).

2. Chromium present in ground water is in the dissolved state.

3. The area in which chromium concentration exceeds 50 μg/L is 1,001,500 ft^2.

4. The volume of contaminated ground water = 75x10^6 gallons; (based on 25 ft saturated thickness, 40% porosity and 7.48 gal/ft^3).

5. Chromium source location can be approximated as the eastern portion of the overflow pond (Figure 4-1 of RI).

6. Chromium source concentration in ground water directly beneath the source location is approximately 16,000 μg/L; (see section (C) below for calculations).

7. Chromium has entered the ground water media for approximately 10 to 30 years.

8. Distribution coefficient for chromium = Kd = 3.5 mL/gram; (see section (D) below for calculations).

9. Retardation Factor = R = 1 + (ρ/n)(Kd) = 20.

(C) ESTIMATION OF SOURCE CONCENTRATION

1. The range in possible dissolved chromium concentration falls between 800,000 μg/L, an average pore water concentration taken from surface soil/sludge samples near the presumed source area (Figure 4-3 of RI), and 8,710 μg/L, the maximum aqueous concentration detected in well R-23.

2. The solubility of various chromium compounds as a function of Eh and chromium concentration was modeled using the program WATEQ. The results were used to estimate dissolved chromium concentrations under Eh conditions anticipated for the aquifer. Temperature, pH, and the concentrations of major ions were taken from sampling results of well R-23, the well closest to the presumed source. Iron concentration was unknown but was assumed to be 0.05 mg/L. The above parameters were held constant as several chromium concentrations, within above the range, were run over a series of Eh conditions.

   The WATEQ model outputs yield a saturation index (SI = log (ion activity product/equilibrium constant) for various minerals under equilibrium conditions for the geochemical conditions that are input. A positive SI indicates a mineral phase will precipitate; a negative SI indicates mineral solubility under the given conditions. A SI of zero indicates equilibrium between dissolved and solid mineral phases. The model also indicates which ion species will be dominant under the stated conditions.

   The model results indicated that, for a given chromium concentration, as the Eh increased the SI decreased (chromium mineral species became more soluble) and that the dominant ion species changed from trivalent to hexavalent chromium. Conversely, for a given EH, as chromium concentration increased the SI increased (mineral species precipitated) and the dominant ion species tended toward the trivalent forms of chromium. The goal of the WATEQ runs was to maximize chromium concentrations, have the dominant chromium ion species be in the hexavalent form, maintain a SI near zero and minimize the Eh.

   Natural ground water is generally under reducing (negative Eh) conditions. The chromium-rich source water is presumably derived from recharge water from an unlined pond, so the ground water below the pond was assumed to be slightly oxidizing. It was assumed that, since chromium is probably not under equilibrium conditions in ground water below the source, the Eh at which equilibrium conditions prevail in the WATEQ outputs will probably be artificially elevated. Eh inputs to the WATEQ model thus ranged from 350 to 650 millivolts.

The above modeling efforts indicated that at an Eh of 550 to 600 millivolts, hexavalent chromium ion species are dominant and various chromium mineral species are approximately in equilibrium between dissolved and solid phases when the chromium concentration is approximately 16,000 µg/L. This was assumed to be the likely maximum concentration of dissolved hexavalent chromium in ground water immediately below the presumed surface source areas.

3. A plot of chromium concentration observed in wells downgradient of the presumed source was evaluated to determine what the extrapolated concentration at the source would be. The chromium concentrations from wells R-23, R-24, R-25, and P-65 were found to follow a log normal probability density function. The log-transformed concentrations were plotted against distance. A linear relationship between log transformed concentration and distance appears to exist if the results from well R-25 are ignored. An extrapolation of the linear trend amongst wells P-65, R-244, and R-23 to distance = 0 yields a chromium concentration of approximately 15,850 µg/L, which agrees well with the dissolved chromium value derived from the WATEQ mineral solubility calculations.

(D) CALCULATION OF CHROMIUM DISTRIBUTION COEFFICIENT (Kd)

1. Literature search:

   Kd values of 2.3 and 2.4 were obtained from a column experiment with initial Cr(VI) concentration of 50,000 µg/L, pH = 6.8, ρ = 1.6 g/cm^3 and n = 0.40 (Stollenwerk and Grove, 1985).

2. Based on Retardation Factor (R):

$$R = \frac{\text{distance traveled by conservative solute}}{\text{distance traveled by } C/C_o = 0.5 \text{ concentration of Cr}}$$

   Assuming the conservative solute is the average effective ground water flow velocity (200 ft/yr) and the duration of chromium contamination is 10 to 30 years, the distance traveled by ground water ranges from 2,000 to 6,000 ft. Further assuming an initial concentration of 16,00 µg/L, the distance that half this concentration (8,000 µg/L) has traveled is approximately 200 ft. R therefore ranges from 10 to 30. The equation relating R to Kd is:

$$R = 1 + (\rho/n)\,(Kd)$$

   Therefore, Kd ranges from 1.7 to 5.4.

3. Current data indicate that the chromium in the ground water at the site is predominately in the Cr(VI) state. This is consistent with a fairly oxidizing ground water at neutral pH values. Thermodynamic modeling under these conditions indicate that the predominate species is CrO_4^{2-} (chromate ion). Based on this analysis, literature was reviewed for appropriate data on adsorption of chromate. The most consistent data were found in an article by R.A. Griffin, A.K. Au, and R.R. Fist (J. Environ. Sci. Health, A12(8), 431-449, 1977). Analyses of the data from this article yield distribution coefficients ranging from 0.42 to 3.2 for pH values between 7 and 7.5.

4. Based on optimization calculations for R;

   Using site-specific data, the difference between observed and calculated concentrations of chromium in ground water was calculated for varying R values at 10, 20, 30, and 40 year time periods. The following equation was used in the optimization:

$$F(x) = (A_{calc.} - A_{obs})^2 + (B_{calc.} - B_{obs.})^2 \quad \text{where}$$

A_{calc}, B_{calc} = Calculated concentrations at two points A and B.
A_{obs}, B_{obs} = Observed concentrations at A and B, as ratios of C/C_o

   Well R-23 was selected as Site A. The observed concentration is (8,710 µg/L)/(16,000 µg/L) = 0.5444. Distance from the source is assumed to be 150 feet. One of the chromium concentrations at wells R-24 and R-25 appears to be anomalous in that the closer well (R-25) had a lower reported Cr concentration than well R-24, located almost 100 feet farther from the presumed source. Accordingly, the dissolved chromium concentrations were contoured (assuming a log-normal distribution) and a second observation point between the two wells, assumed to be more representative of chromium distribution, was selected as point B in the above equation. The observed concentration at B is (100 µg/L)/(16,000 µg/L) = 0.0063, and is located 800 ft from the source.

   A one-dimensional analytical solution (Van Genuchten and Alves, 1982) that incorporates advection, hydrodynamic dispersion, and linear adsorption was used in obtaining the calculated concentrations at distances corresponding to locations A and B. The model assumes a fully reversible, linear adsorption isotherm, constant input concentration (Co) and no solute decay other than what is adsorbed. The calculated and observed concentrations were compared using the above equation for R values of 10, 15, 20, 25, 30, and 40. The resulting value, F(x), was plotted against R for each time period. The resulting figure indicated that F(x) is highly dependent on the time period selected, for R values ranging from 15 to 40 (Kds ranging from 2.6 to 7.3).

Based on the various methods used to assess Kd and R for chromium at the Selma site, a value of 3.5 mL/gram was selected for the distribution coefficient Kd. A retardation factor of 20 was assigned based on the above Kd. These values each have a significant effect on the solute travel time and ground water extraction rate calculations which follow, but can only be considered as estimated quantities. More rigorous methods to calculate Kd and R, based on additional field data, are highly recommended.

NO ACTION ALTERNATIVE CALCULATIONS

(A) BACKGROUND

The objective was to determine how long it would take for chromium to migrate from an on-site source area, presumably located near the overflow ponds (Figure 4-1 of RI), to a downgradient off-site well located south-southwest of the Selma site. The effects of advection solute dispersion and solute adsorption onto aquifer materials were incorporated into the travel time calculations.

(B) METHODS

A one-dimensional analytical solution (Van Genuchten and Alves, 1982) was used in the travel time calculations. The advection-dispersion equation with adsorption given below is the governing equation:

$$R_{\partial t} = D_{\partial x^2} - V_{\partial x}$$

where c = concentration, t = time, x = distance, other variables previously defined. The initial and boundary conditions are as follows:

$$c(x, 0) = C_i$$

$$c(0,t) = \begin{cases} C_o & \text{for } 0 < t < t_o \\ 0 & \text{for } t > t_o \end{cases}$$

$$\frac{\partial c}{\partial x}(\infty, t) = 0$$

Initial concentrations (C_i) were assumed to be zero. Source concentration (C_o), constant throughout the modeling period, was assumed to be 16,000 µg/L based on Assumptions, Section C above. The resulting analytical solution (Van Genuchten and Alves, 1982) is as follows:

$$c(x,t) = \begin{cases} C_i + (C_o - C_i)\,A(x,t) & \text{for } 0 < t < t_o \\ C_i + (C_o - C_i)\,A(x,t) - C_o A(x,t-t_o) & \text{for } t > t_o \end{cases}$$

Where

$$A(x,t) = \frac{1}{2} \operatorname{erfc} \frac{Rx-vt}{2(DRt)^{\frac{1}{2}}} + \frac{1}{2} \exp(vx/D) \operatorname{erfc} \frac{RX + vt}{2(DRt)^{\frac{1}{2}}}$$

Travel times were defined as the length of time required for the target concentration of chromium to reach a receptor well located approximately 2,000 feet downgradient from the source. The action level for chromium is 50 μg/L. The target concentration, however, was chosen to be twice this value or 100 μg/L. It is assumed, under a worst-case scenario, that the receptor well receives half of its water from the contaminated near surface aquifer, due to faulty well completion, and that the hydraulic gradient is equal to the maximum gradient observed during the RI (0.0017 ft/ft). Thus, 50 μg/L chromium coming out of the receptor well is assumed to equate to 100 μg/L chromium reaching the well from the contaminated aquifer.

(C) RESULTS

The assumptions used to compute chromium travel times represent a conservative or minimum time scenario. Based on the current chromium distribution in ground water and the piezometric surface, neither of the nearest potential receptor wells (R-10 and R-14; Figure 2-7 of RI) appear to be immediately downgradient of the presumed source area. Dispersion transverse to the flow direction would increase the time required for the target chromium concentration to reach either receptor well. Assuming that the potential receptor well receives half of its water from the near surface contaminated aquifer is also extremely conservative. The regional well completion data presented in Table 2-3 of the RI indicates that all of the wells within 3,000 downgradient of the Selma site are screened no less than 90 feet below surface. It is likely that little or no water from the contaminated aquifer would enter the screened interval of the receptor wells. To have an effect on receptor well water quality, extremely high chromium concentrations would probably need to be present in the shallow aquifer around the well.

Using a hydraulic conductivity of 200 ft/day, hydraulic gradient of 0.0017, retardation factor of 20, a dispersivity of 100 ft, and the above assumptions, the modeling results indicate that it would take an estimated 30 years for the chromium plume in its present configuration to exceed the target concentration in a receptor well located 2,000 feet downgradient. Approximately 45 years would be required for the existing plume to exceed the target concentration in a hypothetical well located 2,500 feet downgradient.

For an aquifer hydraulic conductivity of 400 ft/day, a likely maximum value, chromium exceeds criteria as defined above in approximately 15 years for a well 2,000 feet downgradient and in approximately 20 years for a well located 2,500 feet downgradient.

GROUND WATER EXTRACTION CALCULATIONS

(A) BACKGROUND

A preliminary analysis was undertaken to estimate both the total volume and the rate at which chromium contaminated ground water needs to be extracted to reduce ground water concentrations down to 50 μg/L chromium. Two year and five year ground water cleanup time periods were evaluated. Well field designs involving both extraction and recharge wells were modeled. Approximate capital costs for both designs are summarized.

(B) METHODOLOGY

The volume of water required to be pumped out of the aquifer was estimated using a mixing cell model, which calculates the number of pore volumes (based on total porosity of the aquifer) that need to be removed. The mixing cell model incorporates compound adsorption and desorption between the aquifer soil and water. Each iteration in the mixing cell model involves replacing the contaminated ground water in a unit volume of aquifer media with clean water. The volume of ground water which is replaced in each iteration is determined by the effective porosity of the aquifer media. The contaminant of interest is then desorbed from the aquifer media into the clean ground water, causing a corresponding decrease in concentration of the compound present in the aquifer media. Desorption from the aquifer media into the aquifer fluid is dependent upon the distribution coefficient (Kd) of the compound being modeled. It is assumed that compound adsorption/desorption is reversible and follows a linear isotherm. The mixing cell model continues until ground water concentrations from desorbed aquifer media compounds are below the desired concentration value. The number of iterations required to attain the desired ground water concentration value represents the number of pore volumes required to clean up the aquifer being modeled.

The mixing cell model was run assuming an initial concentration of 16,000 μg/L chromium, Kd of 3.5, ρ and n previously defined. The number of pore volumes required for cleanup varies as a function of concentration, so the estimated plume area was broken into five zones of assumed equal chromium concentration (as derived from the analytical solute transport solution). Given an initial estimated area in which chromium exceeds 50 μg/L of 1,001,500 ft^2, the area and volume of each of the five zones was calculated. Although compound adsorption was assumed to follow a linear isotherm and be completely reversible, the findings of Stollenwerk and Grove (1985) suggest that at low chromium concentrations the Kd increases. To account for this phenomena, the maximum estimated concentration present in each of the five zones was assumed to be the chromium concentration for the entire zone. The mixing cell model results were then used to determine how many pore volumes of water had to be removed from each zone, based on the concentration assigned to each zone, to achieve cleanup. The following table summarizes the area, volume, estimated Cr concentration, number of pore volumes, and total volume required for cleanup in each of the five zones.

Zone	Maximum Concentration (µg/L)	Area (ft²)	Volume (gal)	Number of Pore Volumes	Total Volume (gal)
1	90	400,000	29,920,000	11	329,120,000
2	330	333,000	24,908,400	35	871,800,000
3	1,200	151,500	11,332,200	58	657,270,000
4	8,710	85,200	6,373,000	94	599,060,000
5	16,000	32,800	2,453,400	105	257,610,000
Totals		1,002,500 ft²	74,987,000 gal		2,714,860,000 gal

The total volumes required for each zone, presented above, provided the basis for the well field designs. A net ground water extraction rate was calculated for each zone for both the two and five year cleanup scenarios. A minimum number of wells were placed in each zone such that total discharge rates met the calculated extraction rate for each zone and the aquifer was stressed sufficiently without causing dewatering. Effects of the regional hydrauic gradient on capture zones of individual wells was not considered in the calculations.

The model used in the well field designs is General Aquifer Analysis (Koch & Associates, 1986). This two-dimensional program assumes Theis conditions in the aquifer and adjusts drawdowns for an unconfined aquifer via the Jacob correction factor, for decreasing saturated thickness. The model further assumes that each well is fully penetrating, has a constant discharge and well casing storage is negligible. Aquifer hydraulic conductivity (150 ft/day), specific yield and saturated thickness (previously defined) were assumed constant throughout the model area. Due to the variable pump rates required for each zone within the chromium plume and access limitations associated with U.S. Highway 93, a uniform well field grid was not attempted.

(C) RESULTS

The two year ground water cleanup scenario was achieved via 35 extraction wells and 45 recharge wells. The extraction wells pumped at rates of 55 to 100 gallons per minute (gpm) with systemwide average pumping rates of approximately 74 gpm. The modeled extraction system would deliver approximately 2,580 gpm to an assumed on-site treatment system. The recharge wells would inject treated water via gravity drainage at rates varying between 40 and 75 gpm. Passive recharge is not expected to be as efficient as well-induced discharge, so a greater number of recharge wells are required to replace the water removed by the extraction wells. Well efficiencies, however, were not considered in the modeled well field system. Drawdowns after two years ranged from approximately 24 feet near the highest-yield wells to approximately 3 feet near the recharge wells. It is assumed that any treated water which is not reinjected into the aquifer can be discharged into an existing municipal sewer system.

The design assumes that the extraction wells will be 6 inch ID steel wells completed under Level D health and safety conditions in 12 inch holes drilled via air hammer or rotary techniques. Twenty feet of galvanized steel screen and 30 feet of steel casing would be installed in each well. Well development water will be treated at the on-site treatment system. Piping systems to convey extracted and recharge water to and from the wellheads are approximate; however, the well field design assumed that wells installed southwest of U.S. Highway 93 had water routed along South Avenue under the highway. Each extraction well would have an automatic water level sensor and cutoff device to regulate discharge and minimize pump motor maintenance. The recharge wells would be installed in 10-inch holes drilled with hollow stem auger techniques. Twenty-five feet of high efficiency 4-inch PVC screen and 25 feet of 4-inch schedule 40 PVC casing would be installed in each hole under Level D conditions.

Capital costs are summarized in Table 1. The cost summary does not include costs associated with land acquisition, right-of-ways, pipe distribution system burial, or the treatment system. Operations and maintenance costs, including power, recharge well cleaning and maintenance, and equipment replacement were also not developed for the alternatives.

The five year cleanup scenario is similar to the two year design, except that fewer wells are required to remove the required volume of ground water. The five year design involves 25 extraction wells, which pump at rates between 20 and 60 gpm, and 35 recharge wells which have design recharge rates of 10 to 30 gpm. The system flux is approximately 1,040 gpm. After five years, drawdowns range from approximately 17 feet near extraction wells to 7 feet near recharge wells. All other aspects are similar to the two year design. Capital costs are summarized in Table 1, excluding operations, maintenance, and other costs discussed above.

It should be noted that both well field designs and their associated costs are preliminary. The final well field designs will probably contain fewer wells that are spaced further apart and pump at higher rates. The exact spacing of wells and pump rates for individual wells cannot be determined without the use of more sophisticated modeling techniques and additional site aquifer tests and contaminant distribution data. The suggestion that Kd, and thus R, increases with decreasing chromium concentration (Stollenwerk and Grove, 1985) could mean that chromium cannot be completely removed (below the 50 μg/l action level) in either a two-year or five-year scenario. Methods to accelerate chromium desorption as concentrations decrease should be evaluated. Potential methods may include a pulsed ground water extraction scenario, oxygenating recharge water to increase aquifer Eh and raise chromium solubility or adding a chromium ion exchange medium such as amonium acetate to the recharge water.

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TABLE 1

CAPITAL COST SUMMARY FOR WELL SYSTEM

Component	Unit Cost	Two-Year Scenario Estimated Quantity	Two-Year Scenario Total Cost	Unit Cost	Five-Year Scenario Estimated Quantity	Five-Year Scenario Total Cost
EXTRACTION WELLS						
Drilling Mobilization	$175/hr	16	$ 2,800		16	$ 2,800
Drilling Completion and Development Time (10 hr/well)	$175/hr	350	61,200		250	43,750
6" Steel Casing (30 ft/well)	$ 10/ft	1,050	10,500		750	7,500
6" Galv. Steel Screen (20 ft/well)	$ 40/ft	700	28,000		500	20,000
Misc. Materials (sand, cement, etc)	$ 4/ft	1,750	7,000		1,250	5,000
@ 50 ft well)						
Pump (4" pump @ 60 gpm)	$680/ea.	35	23,800		25	17,000
Pump Set Up (4 hr/well)	$ 50/hr	140	7,000		100	5,000
Protective Clothing & Materials Fee	$ 50/crew-hr	350	17,500		250	12,500
Cuttings Disposal (8/hole)	$250/drum	280	70,000		200	50,000
			$ 228,000			$ 163,600
RECHARGE WELLS						
Drilling Mobilization	$140/hr	16	$ 2,200		16	$ 2,240
Drilling Completion and Development (8/hr well)	$140/hr	360	50,400		280	39,200
4" PVC Casing (25 ft/well)	$4.50/ft	1,125	5,100		875	3,950
4" PVC Screen (25 ft/well)	$36.00/ft	1,125	40,500		875	31,500
Misc. Materials (50 ft/well)	$4.00/ft	2,250	9,000		1,750	7,000
Protective Clothing & Materials Fee	$50/crew-hr	360	18,000		280	14,000
Cuttings Disposal (6/hole)	$250/drum	270	67,500		210	52,500
			$ 193,000			$ 150,400
Well Installation Totals			$ 421,000			$ 314,000

TABLE 1 (cont.)

CAPITAL COST SUMMARY FOR WELL SYSTEM

Component	Two-Year Scenario Unit Cost	Two-Year Scenario Estimated Quantity	Two-Year Scenario Total Cost	Five-Year Scenario Unit Cost	Five-Year Scenario Estimated Quantity	Five-Year Scenario Total Cost
DISTRIBUTION SYSTEM						
SW of Hwy. 93						
2" Steel Pipe	$17.00/ft	1,300	$ 22,100			
6" Steel Pipe	$38.00/ft	900	34,200			
4" PVC Pipe	$10.00/ft	900	9,000			
2" Poly Ethylene Pipe	$7.50/ft	1,300	9,750			
NE of Hwy. 93						
2" Steel Pipe	$17.00/ft	5,600	$ 95,200			
12" Steel Pipe	$76.00/ft	400	30,400			
8" PVC Pipe	24.00/ft	400	9,600			
2" Polyethylene Pipe	$ 7.50/ft	5,600	42,000			
Miscellaneous						
Control Valves (Automatic Water Level Sensor & Cutoff)	$570	35	$ 19,950			
Holding Tank	$25,000	25,000				
Distribution System Totals			$ 297,200			

TABLE 1 (cont.)

CAPITAL COST SUMMARY FOR WELL SYSTEM

Component	Two-Year Scenario			Five-Year Scenario		
	Unit Cost	Estimated Quantity	Total Cost	Unit Cost	Estimated Quantity	Total Cost
SW of Hwy. 93						
1¼" Steel Pipe				$16.50/ft	1,100	$ 18,150
4" Steel Pipe				$25.00/ft	900	22,500
4" PVC Pipe				$10.00/ft	900	9,000
1¼" PVC Pipe				$ 3.00/ft	1,100	3,300
NE of Hwy. 93						
1¼" Steel Pipe				$16.50/ft	3,800	$ 62,700
8" Steel Pipe				$57.00/ft	400	22,800
6" PVC Pipe				$19.50/ft	400	7,800
1¼" Polyethylene Pipe				$ 3.00/ft	3,800	11,400
Miscellaneous						
Control Valves (Automatic)				$570	25	$ 14,250
Holding Tank				$25,000	1	25,000
Distribution System Totals						$ 196,900
SUBTOTAL COST			$ 718,200			$ 510,900
Engineering, Contingency, Construction Management (0.3)			$ 215,500			$ 153,300
TOTAL COST			$ 933,700			$ 664,200

determined that the soluble levels of chromium are below the clean-up goal but potentially pose a threat to groundwater quality, then additional chromium contaminated soil below the clean-up goal will be evacuated and treated.

Comment 23: Dioxin in the soil is not addressed by fixation (Page 13, 1st para.).

EPA Response:

EPA's preferred treatment method, Alternative 3, consists of solidifying and fixating (stabilizing) the contaminants in the soil. The organic soil contaminants, including dioxin, are remediated by encapsulating them in a high strength, low permeability monolith. However, vendors are also marketing fixative reagents which immobilizes the toxic organic soil contaminants, as well as the inorganic contaminants. The organic compounds are stabilized by adsorption to the fixative agent. The required leach tests would be performed on the treated soil to assure that, through a combination of solidification and fixation processes, the dioxin is remediated to acceptable levels.

Comment 24: The definition of the lateral extent of chromium-affected groundwater and the number of plumes have not been defined. The possibility of a plume originating in the vicinity of drainage discharge area at the intersection of Dockery Avenue and Highway 99 has not been evaluated (Page 13, 3rd para.).

EPA Response:

See responses to comment numbers 1, 2, 10 and 12.

Comment 25: We have some concerns as to the estimated groundwater extraction rates, number of extraction wells, the treatment process proposed, the years of operation, and the estimated annual operating cost. We strongly question CDM's estimate of 25 extraction wells with a resultant flow rate of over 1,000 gpm. In the absence of quantitative data for the hydraulic properties, the number and location of required extraction and recharge wells cannot be properly determined (Page 13, 4th and 5th paras., Page 14, 2nd para.)

EPA Response:

The flow rates, treatment period, and O&M costs were based on a two-dimensional modeling effort conducted for the site. The modeling is preliminary in nature and was performed to determine the relative costs of the water treatment system. A more detailed modeling effort to accurately design an extraction and recharge well field will be performed during the RD following the collection of the additional data. The groundwater treatment process proposed in the FS is a very common and widely accepted process. In regard to the quantitative data, an additional constant discharge aquifer test will be performed. This test will supplement the existing quantitative data obtained from the slug tests.

Comment 26: Our concern over the CDM treatment process is that CDM has assumed the bulk of chromium is trivalent chromium rather than hexavalent chromium (Page 14, 3rd para.).

EPA Response:

EPA recognizes that hexavalent chromium is present in the groundwater. The FS indicates that the treatment system will be flexible enough to include hexavalent chromium treatment (e.g., pages 3-50 and 3-51). The exact configuration of the treatment system will be determined during the RD following the collection of the additional data.

Comment 27: We question the use of sludge lagoons for sludge handling (Page 14, para. 4).

EPA Response:

Sludge lagoons were included as the sludge dewatering component of the water treatment alternatives to take advantage of Selma's hot and dry climate. High evaporation rates during large portions of the year are conducive to lagoon implementation. Lagoon design included a double liner system and leachate collection measures to protect against possible leakages.

It was recognized in the FS report that other sludge handling measures should be evaluated and compared with sludge lagoons. On page 3-53 the following statement is made: "Alternative sludge dewatering processes, such as centrifuges or rotary drum filters, will be evaluated, and compared to sludge lagoons during the remedial design stage of the project."

Comment 28: CDM has consistently taken an overly broad and costly approach to the RI/FS. The current series of investigations should have more closely defined the lateral and vertical extent of chemical concentrations. Treatability studies should have been conducted. The results of the site investigation are therefore inadequate for the final selection of remediation techniques and the estimation of performance and cost (Section III, pgs. 14 and 15).

EPA Response:

This comment is addressed in the response to comment numbers 1, 2, 3, 4, 5, 17, 18, 20, and 24.

Comments to EPA in a Letter from Mr. James D. Wilson of Harding-Lawson Associates dated July 12, 1988.

Comment 1: The lateral extent of the chromium plume (including concentrations greater than 50 micrograms per liter) in groundwater has not been defined and other potential upgradient sources of contamination have not been evaluated.

EPA Response:

EPA will be installing additional wells to define the extent of contamination during the RD phase. EPA is also investigating additional potential sources in the area. These aspects are further discussed under the response to comments 1, 2, and 13 from Mr. Petery's letter.

Comment 2: No monitoring wells have been installed downgradient of two of the four soil contamination areas identified as warranting remediation (the Waste Sludge Pit and the Southeast Disposal Area depicted on Figure 1-22).

EPA Response:

An additional shallow monitoring well will be installed downgradient of the southeast disposal area (see comment no. 12, Mr. Petery's letter). In regard to the waste sludge pit, existing well R-22 is located approximately downgradient. An additional shallow monitoring well to be installed during the RD will be located approximately 400 feet due west of existing well R-24. This well will be installed to define the extent of groundwater contamination and will be located downgradient of the waste sludge pit. These additional wells, in combination with the existing wells, will be sufficient to determine the potential contribution to the groundwater contamination from these two sources.

Comment 3: The hydraulic parameters that control groundwater flow and contaminant transport at the site have not been adequately evaluated (no aquifer tests).

EPA Response:

This comment has been addressed under the response to comment number 16 from Mr. Petery's letter.

Comment 4: Insufficient temporal water-level fluctuation data are present.

EPA Response:

EPA will collect monthly water level data for a period of one year during the RD. This data will be sufficient to define the temporal water-level fluctuations.

Comment 5: Because of data validation problems, no valence-specific chromium data (hexavalent versus trivalent chromium) are available for soil or groundwater.

EPA Response:

EPA will collect additional valence-specific chromium data for both soil and groundwater during the RD. Additional information is presented in the responses to comment numbers 6 and 11 of Mr. Petery's letter.

Comment 6: No characterization data are available for the ditch along Highway 99 or the reported "effluent pond" within the treatment area.

EPA Response:

Additional surface and subsurface soil samples will be collected along Highway 99 ditch during the RD. These samples will be analyzed for site-specific contaminants. It is not clear to which "effluent pond" the commentor is referring. However, characterization data has been collected for the unlined waste disposal pond and additional data will be collected in this source area as well as the adjacent retort area.

Comment 7: Insufficient soil data are available for the isomer-specific dioxin and furan analyses needed to evaluate whether there is in fact sufficient risk associated with site conditions to warrant remediation.

EPA Response:

The existing isomer-specific dioxin and furan data clearly show a risk associated with the unlined waste disposal pond and the southeast disposal area. Both of these areas exceed the health-based Center for Disease Control (CDC) clean-up level of 1.0 parts per billion (ppb) for dioxin/furan in tetra-chlorinated dibenzodioxin (TCDD) equivalents. However, additional isomer-specific dioxin/furan data will be collected during the characterization activities to be conducted during the RD. These activities are described in the response to comment numbers 1, 2, 4 and 5 of Mr. Petery's letter.

Comment 8: Insufficient soil data are available for evaluating the lateral and vertical extent of soil contamination (metals and organics) in the four areas identified in the FS report that will be subject to excavation and treatment.

EPA Response:

Additional characterization activities for these four areas will be conducted during the RD. These activities are described in the response to comment numbers 1, 4, and 5 in Mr. Petery's letter.

Comment 9: No data collected prior to 1986 were used for the FS.

EPA Response:

The data collected prior to 1986 was utilized to design the approach to the RI. In regard to the FS, the quality of the pre-1986 data was questionable and, as such, the data was not used to evaluate appropriate remedial alternatives for the site. For example, all of the data collected during EPA's RI was subjected to stringent quality assurance/quality control (QA/QC) evaluation during data validation. In addition, EPA's Contract Laboratory Program (CLP) follows established QA/QC criteria to assure the highest data quality can be achieved. The data collected prior to 1986 did not follow these protocols or procedures. In addition, as stated in the Work Plan for the SPT site (June 1985), several of the samples taken are not identified as to location and depth. Others do not have complete records as to the sample results, sampling protocols, or analysis procedures. However, the pre-1986 data will be used during the RD to define general trends in contamination and identify areas which warrant further characterization.

Comment 10: No data have been developed to assess the potential transport mechanisms of site contaminants based on total versus soluble concentrations of any of the chemicals of concern.

EPA Response:

Solubility data for the appropriate contaminants in the soil will be collected during the characterization activities to be conducted during the RD.

Comment 11: No treatability studies have been performed to assess the actual reduction in mobility of site contaminants achievable by the remedial alternatives.

EPA Response:

A treatability study for soil fixation will be conducted during the RD.

Comment 12: pi ". . . would remediate the potential for exposure to . . ." should read ". . . would reduce exposure to . . ."

EPA Response:

The FS does evaluate alternatives which would both remediate the potential, as well as reduce the potential, for exposure to contamination.

Comment 13: pi There is no mention of SARA or the incorporation of ARARs into the evaluation process. Recent guidances from Winston Porter, Assistant Administrator, U.S. EPA, on preparing of FS documents should also be referenced. Full references could be presented in the introduction. Comments on appropriate guidances are presented in the introduction section review.

EPA Response:

Both SARA and ARARs are referenced on page 1-2 of the FS.

Comment 14: pl-1 "The RI data indicate . . . treating operations pose a potential threat . . ."

This statement is not true for two reasons: 1) there was no assessment of risk or threat in the RI report; the Endangerment Assessment was a separate report, and 2) the "potential threat to human health and the environment" was not posed by "previous wood treating operations" but by the results of waste management and disposal activities at the site prior to 1981.

EPA Response:

This statement was eluding to the fact that the risks presented in the Endangerment Assessment were based on the data collected during the RI.

Comment 15: pl-1 "A significant portion of the plume is above the clean-up goal and will require remediation."

The definition of significant needs to be quantified.

EPA Response:

Significant in the context of the statement refers to the portion of the plume which is above the clean-up goal, which represents a large portion of the total plume.

Comment 16: pl-1 "The Feasibility Study (FS) evaluated . . . alternatives based on the data in the RI Report."

This statement is not entirely true. The evaluation is largely based on the Endangerment Assessment, which was not a part of the final RI report. The Endangerment Assessment is particularly relevant in developing an understanding of what remedial actions are appropriate to protect human health and the environment, since only in the Endangerment Assessment are the threats to human health and the environment investigated. Raw data developed in the RI are an inadequate basis for drawing conclusions that the existing conditions pose a threat to human health and the environment.

Evaluation criteria stated in this section are inconsistent with the March 1988 draft RI/FS guidance from EPA on evaluation procedures; furthermore they are inconsistent with procedures stated in the Executive Summary where the appropriate nine criteria were stated (see page 7-3 of the 1988 RI/FS guidance for the listing of the criteria).

EPA Response:

The first portion of this comment is addressed in the response to comment number 14 above. In regard to the evaluation criteria, the criteria used in the FS were consistent with relevant EPA guidance but were not all presented in the referenced citation.

Comment 17: p1-2 "The FS has been prepared in accordance with . . ."

The FS should also be in accordance with the following SARA interpretive memoranda from J. Winston Porter, Assistant Administrator, U.S. EPA:

- Implementation Strategy for Reauthorized Superfund; Short Term Priorities for Action, October 24, 1986
- Interim Guidance on Superfund Selection Remedy, December 24, 1986;
- Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements, July 10, 1987.

EPA Response:

The draft RI/FS guidance dated March, 1988 supercedes the first two items identified above. The ARARs guidance was utilized during the development of the FS.

Comment 18: pl-4 "The groundwater resources . . . have been classified as a beneficial use, sole source aquifer by the California Regional water Quality Control Board."

What is the specific reference for this classification; we are not aware of such a designation under the Safe Drinking Water Act or any other federal or state law?

What aquifer was classified? Does this classification apply to the depths found to contain chemicals?

The statement is confusing because groundwater resources are not a beneficial use. What are beneficial uses of water that has been found to contain chemicals?

EPA Response:

The groundwater resources in the area have been classified as a sole-source aquifer by the EPA under Section 1424(e) of the Safe Drinking Water Act. EPA has also classified the aquifer as a Class IIA current drinking water source with other beneficial uses under the Groundwater Protection Strategy (1984).

Comment 19: pl-5 In the third paragraph, references and/or methodology for identifying disposal areas should be included in the description of site activities.

EPA Response:

These disposal areas and practices were observed by or identified to the CRWQCB and DOHS.

Comment 20: pl-10 Why were no previous data used, either from the EPA's Field Investigation Team or the Brown & Caldwell report?

EPA Response:

This comment has been addressed under the response to comment number 9.

Comment 21: pl-11 Quality Assurance problems related to analyses for trichlorophenols are noted, but no reference is made to the near complete loss of hexavalent chromium data during data validation.

EPA Response:

This comment is accurate in that most of the hexavalent chromium data was rejected during data validation.

Comment 22: pl-19 The discussion of dioxin contamination and Toxicity Equivalent Factors fails to point out that no site-specific samples had 2,3,7,8 TCDD detected in them and there is still no direct documentation of 2,3,7,8 TCDD contamination. All risk evaluations were therefore based on equivalents and using these calculated values, the three worst-case samples were just barely above the clean-up goal. Therefore, it is not clear or demonstrated that a risk-based dioxin problem exists at the site.

EPA Response:

The dioxin/furan sample results, including the results for 2,3,7,8-TCDD, are clearly shown in tables 1-1 and 1-2 of the FS. The results also clearly show that dioxin/furan contamination exceeds the CDC clean-up goal at two locations as discussed in the response to comment number 7 above.

Comment 23: pl-25 The first paragraph concludes that volatile organic chemicals were not found because they had volatilized. Could it be that they were never released? The statement implies EPA has evidence of their release. If so, it should be given.

EPA Response:

Diesel fuel was used as the carrier for the pentachlorophenol. In that volatile components are present in diesel fuel, and pentachlorophenol contamination is present at the site, there is justification to expect volatile contamination at the site. In order to evaluate this potential, samples from the soil borings to be conducted during the RD will be analyzed for benzene, toluene, xylene, and polycyclic aromatic hydrocarbons. These results will determine whether volatile, or diesel fuel-related contamination, is present at the site.

Comment 24: pl-25 Of the 21 borings installed to evaluate subsurface soil conditions, only 4 (S6, 7, 9, and 11) were drilled in potential source areas. This has led to a deficiency in soil data on the lateral and vertical extent of chemicals in the source areas targeted for remediation.

EPA Response:

This comment is addressed in the response to comments number 1 and 4 of Mr. Petery's letter.

Comment 25: pl-27 Why were no analyses performed to evaluate the potential soluble fraction of contaminants in any of the soil samples? This has resulted in insufficient data for evaluating potential migration of chemicals through the soil and into groundwater.

EPA Response:

Additional solubility data will be collected during the characterization activities to be conducted during the RD.

Comment 26: pl-36 The eastern boundary of the chromium plume has not been defined contrary to the statement on Page 1-36. The location of Well P-4S is south of the site, not east. Additional monitoring wells will be required to adequately assess the areal and vertical extent of groundwater contamination resulting from the SPT operations. The SPT RI report has not characterized the areal and vertical extent of groundwater contamination in the vicinity of the site and therefore the technical adequacy of the FS appears to be incomplete.

EPA Response:

Well P-4S is located southeast of both the treatment and past-disposal areas located on the wood treatment facility. Furthermore, well P-4S is located to the east of the plume emanating from these areas, particularly when considering the southwestern groundwater gradients present at the site. Given this information, EPA feels that there is sufficient information to define the eastern boundary of the plume in this area. However, EPA does recognize that additional information on the lateral and vertical distribution of the plume is required in other areas, such as the southwestern boundary of the plume. This information will be collected during the additional characterization activities planned for the RD.

Comment 27: p1-42 We point out that the lack of groundwater monitoring data is confirmed by CDM based on their recommendation that 4 additional wells be installed and sampled. These wells are designed to monitor a zone that is vertically between existing shallow and deep wells.

EPA Response:

As pointed out above, EPA recognizes that additional monitoring data is required.

Comment 28: p2-5 The clean-up goal for arsenic in soil is based on the plausible maximum exposure of dermal exposure and ingestion. The assumptions for these exposures are not justified in Appendix E. This comment also applies to all calculations of health-based risk of arsenic in Appendix E.

EPA Response:

The clean-up goal for the SPT site was based on the average exposure, whereas the vineyard clean-up goal was based on plausible maximum exposure. However, it is not clear why the assumptions are not justified. As such, EPA cannot respond to the comment.

Comment 29: p2-6 Regarding the discussion of the soluble portion of chromium being a problem that was not addressed in the RI or EA, why wasn't it addressed in either document? If this soluble portion is significant enough to qualify the clean-up goals developed in the EA, it suggests that the EA and RI are inadequate with respect to chromium contamination. It also implies that the current FS is based on inadequately documented and/or faulty assumptions.

EPA Response:

EPA recognizes that additional data on the soluble portions of the chromium contaminated soil is required. This data will be collected as a part of the additional characterization activities associated with the RD.

Comment 30: p2-9 Same comments as above, but with regards to the discussion of TTLC and STLC data for PCP.

EPA Response:

See the response to the above comment.

Comment 31: p2-10 No assumptions are stated to justify that 75 million gallons of water beneath the site have chromium concentrations above the clean-up level. All assumptions and methodologies used to calculate this volume should be stated to allow assessment of their validity.

EPA Response:

A two-dimensional groundwater model was utilized to estimate the quantity of groundwater requiring treatment. The assumptions for the model are described in a memorandum, which attached to the Responsiveness Summary.

Comment 32: p2-13 The areas considered for excavation are bounded at best on only two sides with analytical results for surface samples used to define the extent of contamination. In general, the definition of the extent of soil contamination is wholly inadequate for estimating volumes of soil requiring remediation, regardless of clean-up goals.

The proposed depth of excavation is apparently based on no physical or chemical data, which implies that the pursuant remediation scheme analysis may be based on faulty assumptions and misrepresent the appropriate remediate program for the level of contamination truly present.

EPA Response:

Additional soil borings, with associated surface soil sampling, will be performed as a part of the characterization activities performed during the RD. These activities will further define the extent of contamination in the disposal areas to be remediated. The second portion of this comment is addressed in the response to comment numbers 2 and 4 of Mr. Petery's letter.

Comment 33: p2-15 In the second paragraph, reference to chromium and copper is irrelevant since all detected concentrations are below clean-up goals as stated no page 2-5. This reference should be struck.

EPA Response:

The levels of these constituents relative to the clean-up goals are discussed in order to demonstrate that the high levels of total copper and chromium detected at the site are below the clean-up goals. These constituents are also discussed to demonstrate that the arsenic clean-up goal is driving the remediation at the site. Furthermore, the other constituents, particularly chromium, need to be considered from the groundwater protection standpoint. These aspects are relevant points and should have been included in the FS.

Comment 34: p2-17 Discussion of how the wells will be completed to determine the vertical extent of contamination should be present.

EPA Response:

As stated in the ROD, the six intermediate wells will be installed during the RD to define the vertical extent of contamination. These wells will be completed in the interval directly above the clay layer. It is expected that these wells will be completed from 40 to approximately 60 feet.

Comment 35: p2-17 Porosity of 40% is high for coarse-grained soils. What "site-specific lithologic data" was this estimate based on? A reduction of the porosity to 30% (a 25 percent reduction) could account for a reduction of 675 million gallons of water to be treated. A more explicit presentation of the basis for the assumption should be stated.

There is no presentation of the assumptions on which the "mixing cell model" is based. Earlier on page 2-17 it is stated that the hydrostratigraphy is poorly defined; nevertheless, a solute transport modeling effort was undertaken. The assumptions and limitations of this model effort should be clearly stated.

The assumptions used to calculate 2.7 billion gallons of water to be remediated are not clear, therefore there is no basis for assessing the validity of this number.

EPA Response:

The assumptions used for these determinations are presented in the memorandum for the groundwater modeling effort performed at the site. This memorandum is attached to the Responsiveness Summary.

Comment 36: p3-2 The FS states that the greatest risk at the SPT site is associated with contact with carcinogens in the soil. No basis for this statement is given. Assumptions should be stated.

EPA Response:

The statement on page 3-2 of the FS is not entirely correct in that there are various risks associated with exposure to both the soil and groundwater at the site. A summary of the risks for both media is presented in Table 6-1 of the Final Endangerment Assessment.

Comment 37: p3-10 On the basis of the hydrogeologic cross sections of borings completed at the site (presented in RI report), it appears that the "confining layer" beneath the site is of variable thickness, absent at locations, and comprised of materials which include "silty sand", "silt", and "clayey sand". Because of these factors, the effectiveness of a slurry wall "keyed" into the reported "confining layer" is questionable as leakage through this layer seems likely. Therefore, inclusion of the slurry wall as a technically viable alternative is questionable.

The cost estimate for the slurry wall option is $1,730,000 which includes 14 extraction wells. However, no technical data is presented in the RI or FS report to substantiate extraction rates available at the site or the number of extraction wells required to achieve hydraulic containment. This data is basic hydrogeologic information which can be obtained from pump tests or aquifer tests but is not available for the SPT site. The basis for the installation of the 14 extraction wells is required before an assessment of cost for the slurry wall option can be made.

EPA Response:

The existence of a confining layer beneath the site was based on an evaluation of the stratigraphy represented by two cross-sections presented in the FS report (Plates 1 and 2). The plates depict a clay layer approximately 55 feet deep and 5 to 10 feet thick underlying the site. The lack of significant levels of contamination detected at depths between 90 and 120 feet also suggests the presence of this low permeability clay lens is impeding downward groundwater movement.

A subsurface investigation along the proposed slurry wall alignment would be performed during the remedial design phase of the project if this technology was selected for implementation. The investigation consists of a series of borings which would be evaluated to locate and define the confining layer utilized for keying in the slurry wall.

The installation of 14 extraction wells to control the hydraulic gradient in the vicinity of the slurry wall was estimated based on the data available. The accuracy of the cost estimate to construct the slurry wall system is within the range required by EPA guidance for conducting feasibility studies.

Comment 38: p3-50 It is stated that treated wastewater may be used to recharge the aquifer. However, no consideration is given for assessing either the hydraulic, geochemical, or institutional constraints of reinjection.

EPA Response:

Three disposal options for the treated wastewater were listed in the section referenced by the comments. In addition to aquifer reinjection, use as an irrigation water supply and discharge to the local sewer system were mentioned. The objective of this section of the report is to describe potential remedial action technologies. Assessment of hydraulic, geochemical, or institutional constraints would be performed during the RD.

Aquifer remediation is achieved by extracting the chromium plume and thereby allowing clean water to enter the aquifer. The chromium contaminant is desorbed from the aquifer media, into the clean groundwater. This flushing action is aided by the reinjection of the treated wastewater, ultimately resulting in the chromium concentration decreasing to acceptable levels. The theoretical results of the pumping and recharging of the aquifer in terms of water level (hydraulic) impacts is presented in the memorandum on the modeling effort attached to this Responsiveness Summary.

Aquifer reinjection would need to meet the substantive requirements of the Regional Water Quality Control Board, and the Safe Drinking Water Act, 42 USC 1421-1422, and the underground injection control requirements of 40 CFR Part 144 - 147.

Comment 39: p4-1 Alternative 2 does not meet the criterion presented on page 4-1 for an alternative that relies on containment with little or no treatment. As presented in Section 3.3.4, the slurry wall as proposed includes continuously operating ground-water extraction wells (14 extraction wells are shown on Plate 3-1). All ground water thereby extracted will require treatment in a manner identical to the presented for Alternative 4. It appears that no alternative has been presented that addresses containment with little or no treatment.

EPA Response:

Alternative 2 does meet the criterion at a remedial alternative which relies on containment with a minor treatment component. Soil remediation is addressed by constructing a cap over the top of the areas of soil contamination. This does not utilize treatment technologies or process options. The control of contaminated groundwater migration is provided by the slurry wall containing the chromium plume. Groundwater extraction rates necessary to establish a hydraulic gradient towards the plume would be much less than those proposed in Alternative 4. Therefore the quantity of groundwater to be treated under Alternative 2 is significantly less than under Alternative 4.

Comment 40: p4-2 Conclusions are being drawn from a "model," yet details on the assumptions that went into the model are not provided. All assumptions should be stated. An appendix with the details of the modeling analyses must be supplied to enable review of these assumptions.

EPA Response:

The assumptions that went into the model are presented in the attached memorandum. The memorandum includes the details of the modeling analysis.

Comment 41: p4-3 Why was an open slurry wall selected? Why not close the site with a four-sided slurry wall and eliminate the need for pumping since a RCRA cap that would prohibit infiltration is being used? Because the treatment costs for the extracted ground water associated with the slurry wall are not included, serious doubt is thrown on the costs presented for this alternative.

EPA Response:

Closing the site with a four-sided slurry wall would not eliminate the need for pumping. The chromium plume requiring containment has an areal extent of approximately 20 acres. The proposed areas to be capped encompass only 3/4 of an acre of this 20 acre parcel. In order to prohibit infiltration inside the area contained by the slurry wall, the entire 20 acres would require coverage by an impermeable cap. Large areas of existing vineyards, both on site and off-site, would then no longer be available for agricultural applications. Unless the entire site was capped, pumping would be required to control the buildup of hydrostatic pressure on the inside of slurry wall created by stormwater infiltration.

The four-sided slurry wall would be approximately 2,500 feet longer than the wall described in the FS. In addition, portions of the wall would cross Highway 99 in two locations and cut through the existing wood treatment facility.

Comment 42: p4-6 Without a good understanding of the local hydrostratigraphy, it is impossible to understand the potential effectiveness of a slurry wall. Without a continuous competent aquitard to key the base of the wall into, the contaminants can simply flow under the wall as if it were not there. If extraction wells are necessary to make the wall a viable option, then the utility of the wall is in serious question, particularly at a cost of $1,730,000--which does not include costs for a water treatment system, which will be required. Costs presented later suggest an additional $1,770,000 just in capital costs alone will be required for the water treatment system (page 4-35).

EPA Response:

The existence of a confining layer beneath the site was based on an evaluation of the stratigraphy represented by two cross-sections presented in the feasibility study report. A subsurface investigation along the proposed slurry wall alignment would be performed during the design phase of the project if the alternative was selected for implementation. The results of the investigation would be evaluated to define the extent of the aquitard to key the base of the wall into.

Extraction wells would be necessary to make the wall a viable option. Capital costs, to construct an on-site water treatment plant, presented under Alternatives 3 and 4, represent a much greater treatment flow rate than would be required utilizing the slurry wall proposed under Alternative 2. Therefore, capital water treatment costs associated with Alternative 2 would be significantly less than $1,770,000.

Comment 43: The entire detailed evaluation of Alternative 3 is based on a "mixing cell model" that is not justified, described, or explained. It is impossible to evaluate the validity of the detailed analysis for Alternative 3 without explicit details on the modeling effort that is referenced. If the model were improperly formulated, all conclusions for Alternative 3 could be based on faulty assumptions.

EPA Response:

The "mixing cell model" utilized in formulating groundwater treatment rates and quantities for Alternative 3 is described and explained in the attached memorandum on the groundwater modeling effort.

Comment 44: p4-10 Modeling comments presented for Alternative 3 apply to Alternative 4 as well.

The estimated costs presented for each alternative may vary greatly from those stated because the source areas and extent of contamination have been inadequately defined. See comments on Section 2.0.

EPA Response:

The "mixing cell model" utilized in formulating groundwater treatment rates and quantities for Alternative 4 is described and explained in the attached memorandum on the groundwater modeling effort. The estimated costs for the proposed plan (Alternative 3), will be revised following the additional source characterization activities, which will be conducted during the RD.

Comment 45: p4-43 The State of California appears correct to insist that the site be adequately characterized prior to remedy selection. As stated the previously, the data collected thus far are inadequate to define the hydrostratigraphy and volumes of soil and ground water requiring remediation, and therefore the same data are inadequate to support a proper FS or selection of a remedy.

EPA Response:

As stated in various responses to previous comments, EPA feels that there is sufficient data to select a remedy for the site. However, EPA does recognize that additional data will be required to fully define the extent of the remediation. As such, additional characterization activities for both the soil and groundwater contamination will be conducted during the RD.

Comment 46: p5-1 Alternative 1 disadvantages: "The lack of control of contamination migration creates a high potential for the spread of exposure."

"High potential" was not assessed. It should be qualified or the statement struck.

EPA Response:

Under Alternative 1, the transport mechanisms which caused contaminant migration to occur initially would remain in place. Specifically source areas of soil contamination would still be vulnerable to leaching of the contaminants by stormwater runoff and conveyance to groundwater supplies. As the areal extent of aquifer contamination increases, the potential for exposure through groundwater ingestion increases. The longer contaminated surface soils remain vulnerable to wind dispersion, the greater the potential for exposure due to dermal contact, inhalation, and ingestion. For these reasons the EPA states that a high potential for the spread of exposure would exist under the no action alternative.

Comment 47: Alternative 2 advantage: "It has relatively low capital and O&M costs."

Potential costs to treat extracted groundwater were omitted from this alternative. These capital costs would be $1,770,000 and O&M costs could be $1,280,000 per year (see page 4-35). These costs appear to contradict the statement.

EPA Response:

The stated capital costs of $1,777,000 and O&M costs of $1,280,000 per year for the water treatment component of Alternatives 3 and 4 are based upon constructing and operating a 1,040 gpm capacity treatment facility. The rate of groundwater extracted under Alternative 2 would be significantly less than 1,040 gpm, therefore, the costs to construct and operate would be much less.

Comment 48: p5-3 Alternative 2 disadvantage: "The ability of the clay layer to provide adequate foundation to key the slurry wall into may be a limiting factor..."

We agree; further more, this points up the inadequacy of the site characterization to provide sufficient data to evaluate alternatives in the FS.

EPA Response:

There is sufficient data to propose the slurry wall as a component of the containment alternative. If Alternative 2 was selected as the remedial action for the site, a subsurface investigation along the slurry wall alignment would be performed. The results of the investigation would be evaluated to define the extent of the clay layers and determine its ability to provide an adequate foundation to key the slurry wall.

Comment 49: p5-3 Alternative 3 advantage: "It provides for near complete removal of groundwater."

This statement is unjustified and unfounded based on data presented in this FS. An undocumented model was used in the evaluation and no details on its formulation, calibration or sensitivity analyses are provided in the FS.

EPA Response:

The statement referenced in the comment misquotes the FS report. Under advantages for Alternative 3 on page 5-3 the following statement is made: "It provides for near complete removal of the groundwater contaminants."

The attached technical memorandum presents a description of the model employed in the FS.

Comment 50: p5-4 Alternative 4 advantage: "complete removal of groundwater".

See comment for Alternative 3.

EPA Response:

See EPA response to comment number 49 above.

ATTACHMENT

Groundwater Modeling Memorandum